SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class matter. Copyright, 1895, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXII.—No. 8. ESTABLISHED 1845.] NEW YORK, FEBRUARY 23, 1895 [$3.00 A YEAR. WEEKLY.

THE NEW BRIDGE OVER THE EAST RIVER AT BLACKWELL'S ISLAND, NEW YORK.

The erection of a bridge across the East River at Blackwell's Island is an old project, which at last is being carried out. The city of Brooklyn, one of the largest municipalities in the United States, and Long Island, which includes some of the most thickly settled suburbs of the city of New York, depend upon one bridge and upon ferryboats for communication with the metropolis. The estuary called the East River, which separates the cities, is very variable in width, and at Blackwell's Island it is divided into two separate channels of approximately even width, so that there is good ground for the erection of intermediate piers, which will be without objection, as they will not obstruct the channel. We illustrate in this issue the new bridge, work on which is now in active progress.

The bridge is of the cantilever type. It comprises steel trusses carried on Connecticut granite piers. There are to be four railroad tracks, a carriage-way, and a foot-path. Starting with its approaches about a mile from the heart of Long Island City, it is to run across the southern end of Blackwell's Island and lead to a terminal station at Third Avenue and 64th Street, in this city. The Secretary of War at first required a clear height of 150 feet above the river level, but consented to a reduction of height to 135 feet, which is the same as that of the present suspension bridge across the river three miles below.

There are four main piers, each of which is to be 86 by 45 feet in cross-sectional area. The piers are arched. Back of the main piers come the anchor piers, one for each end of the bridge, to which the trusses are tied down to withstand the strain brought by the overhanging cantilevers and connecting trusses. In the six piers, 810,000 cubic feet of stone will be used, the anchor piers alone representing 216,000 cubic feet.

There are three main spans. The central one, which crosses Blackwell's Island, is to be 615 feet, and each river span will be 846 feet long. The trusses are of the American type or pin connected. Their size may be conjectured from the statement that some of the pins will be 18 inches in diameter and that the main girder will be 125 feet deep. Fifty-three million pounds of steel will enter into the construction of the bridge proper and 25,000,000 pounds into that of the viaducts. The structure will be, it is said, the heaviest bridge per lineal foot ever constructed.

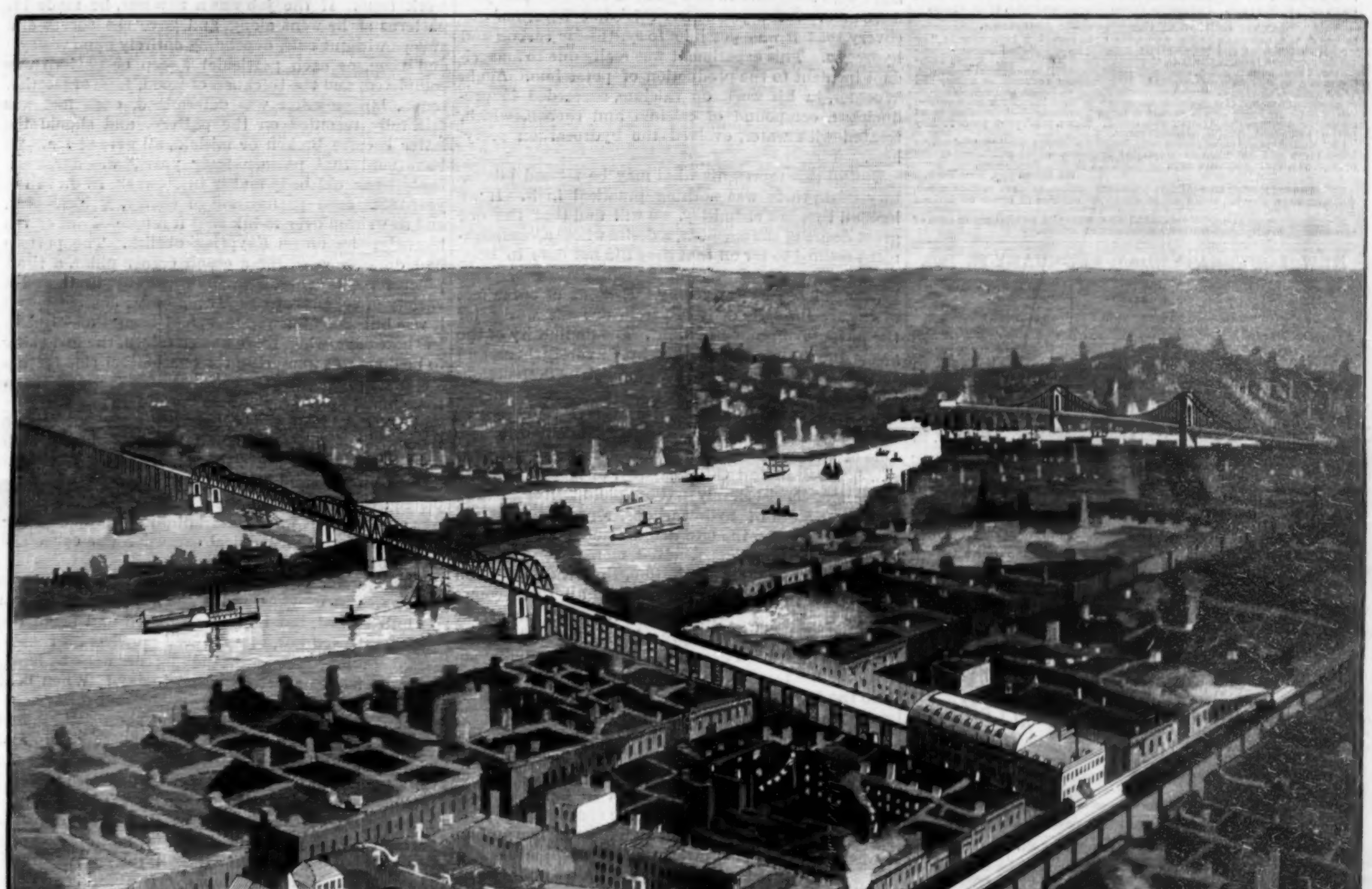
The truss work is under contract by the Pencoyd Bridge and Construction Company, of Philadelphia, Pa.

The terminal station in New York is to cover a full block between Second and Third Avenues in the neighborhood of Sixty-fourth Street. The main floor will contain 12 lines of track. The level of this floor will be 25 feet above that of the elevated railroad. Connections will be made with both Second and Third Avenue elevated roads.

The ground floor will be a market. Long Island is one of the kitchen gardens of New York, and the market will for that reason be under peculiarly good auspices. The basement will be devoted to boilers and machinery, and in a sub-basement will be extensive cold storage rooms.

The bridge will connect with the Brooklyn elevated and surface roads, and will therefore bring the cities on the opposite sides of the East River in most complete intercommunication. The Long Island Railroad will send its trains over it into the center of New York. The operation was financed by ex-Comptroller Myers, and the bridge is looked upon as largely the work of the Long Island Railroad Company or of capitalists connected therewith. The engineer, Mr. C. E. Jacobs, Mem. Inst. C. E., Mem. Inst. M. E., of this city, with his corps of assistants, devoted some twelve months to designing the great structure, whose cost will be about $8,000,000, and whose completion is hoped for by the summer of 1897.

The cut shows the bridge crossing the double channel of the East River, with Blackwell's Island seen between the two main spans. In the foreground is the city of New York, the terminal station facing on the avenue traversed by the elevated railroad being seen. To the right and in the distance is the present suspension bridge. In the background are seen the heights of Long Island, while to the right and on the distant shore is Brooklyn. If all the region about New York is united to form what is known as the Greater New York, the bridge will be a potent factor in establishing a true unity.



THE NEW BRIDGE OVER THE EAST RIVER AT BLACKWELL'S ISLAND, NEW YORK.

An Ocean Steamer Disabled.

Much anxiety was caused recently in New York and Paris by the delay in the arrival of the French line steamer Gascogne, a large ship of the first class. She, however, steamed slowly into port, eight days behind time from Havre, and her arrival was the occasion of much rejoicing. The detention was due to the breaking of the piston of one of her compound engines. It was necessary to disconnect the engine and extend the steam pipes so as to unite the remaining engines. It proved to be a tedious and difficult job.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico.................. $3 00
One copy, six months, for the U. S., Canada or Mexico.................. 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for the U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of *seven dollars*. To foreign countries within Postal Union *eight dollars and fifty cents a year.*

Building Edition.

THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans, perspective views, and sheets of constructive details, pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To foreign Postal Union countries, $3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, $5.00 a year. To foreign Postal Union countries, $6.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign Postal Union countries, $11.00 a year.

Export Edition of the Scientific American.

in which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN, published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 50 pages, profusely illustrated. It is the finest scientific, industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places throughout the world. $3.00 a year, post paid to any part of the world. Single copies 25 cents.

☞ Manufacturers and others who desire to secure foreign trade, may have large and handsomely displayed announcements published in this edition at a very moderate cost.

MUNN & CO., Publishers,
361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

☞ Readers are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, FEBRUARY 23, 1895.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 999.

For the Week Ending February 23, 1895.

Price 10 cents. For sale by all newsdealers.

THE COMMERCIAL SYNTHESIS OF CARBON AND HYDROGEN.

The real and prospective triumphs of chemistry have been in the field of synthesis or the building up of compounds. It is always an easier task for man to destroy than to build. Going back to the days of the alchemists, we recognize in their attempts to discover the philosopher's stone what was really a search for the formation of gold, and in their attempts to discover the elixir vitæ we can picture them as attempting the creation of life, or at least the prolongation of vital energy beyond its natural period, amounting to the synthesis of life itself. It is now but little over a century since modern chemistry had its birth in the discovery of oxygen, something which did away with the old phlogiston theory. Oxygen was produced by heating mercuric oxide, so that the cornerstone of chemistry was a destructive process.

As chemistry advanced, the work of the great chemists early took the form of analysis, Scheele and Berzelius being among those who set the example of patient, laborious analytical work, while the great field of synthesis remained comparatively untouched. It was in 1828 that Woebler made his famous synthesis of urea from ammonium cyanate, producing thus a compound in every sense organic by purely chemical processes. Later the synthesis of cyanogen from carbon and nitrogen was effected. This made it possible to start with solid carbon and gaseous nitrogen and produce urea. A few years after this came Berzelius' discovery that it was possible to synthesize carbon and hydrogen. This experiment was really due to an accident incident to the production of potassium. Again Woehler, in his work on calcium, succeeded in producing a compound of calcium and carbon, which, treated with water, evolved the hydrocarbon acetylene.

But all this represents what may be termed laboratory work; there was nothing practical in it. If we look all through chemistry, we will find that the one great desire of the chemists, a desire whose accomplishment seemed so far off that they did not dare to hope for it, was the synthesis of carbon hydrogen. This synthesis leads to everything. Millions of cubic feet of gas are annually delivered from our gas works for the purpose of producing light. The luminosity of the gas is due to the presence therein of hydrocarbons, and these hydrocarbons have to be formed by destruction. Coal or naphtha, both products originating in the workshops of nature, are destructively distilled to give the necessary illuminating constituents to the gas. One of the most colossal companies the world ever saw is the Standard Oil Company, of America, whose operations consist simply in the exploitation of nature's enormous store of hydrocarbons, represented by petroleum. Among the late achievements in the fields of chemistry none has received more attention, and excited more popular admiration, than the production of coal tar colors, but at the basis of all these comes the inevitable hydrocarbon, and the coal tar of the gas companies with its store of benzone and similar products has been drawn upon for the production of dyes for the textile goods of the world. If we come into the field of hygiene, we find the new medicines made from hydrocarbons originally.

But at last it seems as if the great synthesis had been accomplished, and the electric furnace, the producer of aluminum and silicon alloys, of carborundum, which almost rivals the diamond in hardness, now figures as the agent in effecting the synthesis of carbon and hydrogen. By exposing a mixture of lime and anthracite coal to the electric arc a heavy semi-metallic mass is produced. At first it was produced by an accident and the material was thrown away, some of it into a bucket containing water. A gas of powerful odor was produced which was found to be combustible, which proved to be acetylene, and at last the problem of a century of chemistry was solved, and solved by pure accident. It is interesting to note that in the iron industry the same synthesis is made possible. Cast iron is a combination of iron and carbon. Treated with acid, the iron dissolves, and the carbon unites with the hydrogen of the acid and hydrocarbon gas is evolved. This fact is taken advantage of in the analysis of cast iron in order to distinguish between the combined and uncombined carbon, but like the potassium production of acetylene, there is nothing practical in it. But the new process seems to be practical. The calcium carbide is comparatively cheap. A stick of the solid material represents a producer of illuminating gas, five or six per cent of which gas will convert non-luminous water gas to gas of the finest quality. If the material is immersed in water, the acetylene is given off. Again, the acetylene can be converted into the so-called coal tar colors, and can be made the starting point for the numberless series of organic compounds now produced in the technical factories.

The possibilities of the discovery are perfectly dazzling. Undoubtedly coal tar colors will for many years continue to be coal tar colors; bituminous coal and naphtha will continue to be sources of commercial hydrocarbons for lighting and heating purposes. But the enlightened mind judges of the greatness of discovery by scientific possibilities, not only by economic ones. In the electric synthesis of calcium and carbon leading to the production of acetylene we have a discovery whose economic future may yet prove to be of world-wide importance, and whose scientific interest is of the highest. We have recently published several articles on the subject, and we warmly commend them to our readers; and elsewhere in this issue will be found a discussion on this discovery.

Reflections by an Old Time Woodworker.

An old time carriage builder relates in the Hub how they built carriages fifty years ago and the changes machinery has wrought in the construction. They who are engaged in any part of the woodwork in a carriage factory at the present day know little of the difficulties that surrounded the workmen of the days prior to the sixties, but it will not do to make claim of better mechanics now than then; for while the change has simplified the labor, removed much of that which was extremely tiresome, it has not elevated the skill of the mechanics as a class. There are a few to-day who outrank in skill and technical knowledge those of fifty years ago, but they who do the bulk of the work are not skilled as were the former workmen. The body maker of those days had little more than an outline to work from. If the job was a new one, he made his patterns as he went along, and gave the curves and sweeps without rule, depending entirely upon the eye; and then, as each particular sweep or pattern was completed, and the thickness of wood, form of mortise, tenon, lap or miter was determined, each fact was faithfully recorded on the pattern, and should the latter become broken or mislaid, all were at sea. "I have used that pattern forty years," was a remark made by an old body maker in Newark, N. J., in the year 1857. Said pattern was of cherry, ⅞ inch thick, and so written over in ink that it reminded one of the hieroglyphics on an Egyptian obelisk. The pattern had done its work for a coach corner pillar, a short pillar for a coachee, a family rockaway, brett, and a variety of vehicles of equally dissimilar character, and it was but one of many that had been thus utilized. In those days, when there was no record, the first thing to be done was to mortise the one bottom side for the standing pillars, then mortise the top rail and tenon the pillars, after which these parts were put together and the outside of the bottom side swept off to suit the sweep of the top rail and the turnunder of the door pillars. This done, the corner pillars were fitted on and swept off, and so on until the body was completed; it was "cut and try," and yet when the body was completed it was a model of good workmanship—as good so far as mechanical execution was concerned as the best of to-day.

The manner of working by the body maker was duplicated in every other line. The wheel maker had his hub turned, but he laid off, bored and made the mortises, hewed out, squared and rounded his spokes, sawed and bored his fellies, did all other work by hand, but who makes a better wheel to-day? When bent timber came into use, the steam box and former constituted an important part of the shop fittings, and when the bending was done, all hands turned to and assisted by advice, if not otherwise. Twenty-four per cent perfect was a large average, and fifteen per cent breakage, beyond repair, was a satisfactory result. The chopping block and the broad ax were as much a part of the fittings as was the plane, and one to every two benches was a necessity. All the modern appliances in the line of machinery were absent. In place of a tenoning machine for spokes was a plane with a cutter spur for the shoulders, and guards with a set screw to regulate the depth of the cut. Fortunate, indeed, was the body maker if he had the thick plank sawed up. All their stuff had to be sawed by hand, and the ½ inch panel stuff planed down to ¼ inch by hand. Wages were not so much lower then than now. A good body maker could earn $3 a day; a wheel maker the same or a little more, and a general workman about $9 a week. A top buggy, covered with oil-dressed leather, made up with wood axles and upholstered with moss or rowen covered with curled hair, which, by the way, was picked from the rope by the youngest apprentice in the trimming shop, would sell for from $225 to $250. In view of the fact that every piece of iron was hand forged, all bolts and nuts threaded by hand, paints and colors ground and mixed in the paint shop, we wonder how the carriage builders ever succeeded in business; but they did, and their vehicles were honestly built and did many years' service.

Combined Ship's Buoy.

At the yachting exhibition in London is shown a "combined ship's buoy." It is carried on deck, and when the ship sinks it floats and records at once the hour and minute of the disaster. It then automatically fires rockets, burns blue lights, shows a lamp and rings a bell.

The Brazilian Rubber Tree Tappers.*

The business of rubber gathering, after the forest has been reached, begins with the opening of a "road"—a winding pathway just wide enough to allow a man to pass from tree to tree. Usually 100 rubber trees are connected by one of these roads, the intervals between them varying from twenty feet, or less, to hundreds. While one man's road may not be more than a quarter of a mile long, his nearest neighbor may have to walk five or six times as far to reach the same number of trees.

There is as much difference in the milk from rubber trees as in the milk from different cows. The consistency of the sap varies, some yielding a larger and some a smaller proportion of solid rubber. In the same road one tree may yield a thick, creamy sap, while the next will give a watery one, or even nothing at all, the "flow" being so slight that the sap merely puts in an appearance without reaching the cup underneath. Where several "taps" are made on the same tree, some may run freely, while others give nothing at all. On other trees, again, all the taps may run freely. In view of these differences in quality and quantity of the sap, the yield of a road, instead of single trees, is taken as a standard in any rubber camp.

One man can easily tap 100 trees daily, placing on each five or six cups to catch the sap. These trees, on what is called a good road, will yield, at the commencement of the crop season,† about 22 pounds of sap for each tapping. But all the roads are not equally good, and one with the yield just mentioned may lie next to another with a yield of only 10 pounds of sap. On the lower Amazon, in a field containing several thousand rubber trees, not more than 10 or 12 pounds of sap can safely be counted on for each 100 trees per day. Supposing the trees to be tapped regularly for twelve weeks—the extent of the tapping season—the total yield per tree would be about 7 pounds of sap, or 3½ pounds of cured rubber. But a rubber gatherer can, without great exertion, work two roads during a season, making, at the average yield here mentioned, 700 pounds of rubber. An active, hard-working man can double this product, and can do even better with the help of his wife (seldom with "benefit of clergy") and children. In partially cleared forests a rubber gatherer can care for more trees.

In the state of Amazonas the average size of the rubber trees is larger, and the yield is greater. This is because rubber gathering has not been practiced there so long, and the trees have been allowed to mature fully before being tapped. In the lower districts, where the rubber industry had its origin, the yield per tree is much less now than formerly. A man who worked in the rubber fields forty years ago once told me that he had known roads of 100 trees to yield 40 to 45 pounds of sap per day, while his early employer used to complain because the yield had fallen from 60 and 65 pounds. To-day an occasional rubber tree will sometimes yield two pounds at a single tapping, but there are more on which the scanty exudation dries on the bark without reaching the cup.

The quantity of sap required for making a pound of India rubber varies more than the quantity of milk needed for a pound of butter. While two pounds may be given as the average, very much more is sometimes necessary. The yield of rubber from a given measure of sap is greater at the beginning of the season than at its close, the consistency of the sap steadily diminishing.

The age at which rubber trees become fit for tapping depends upon their surroundings. In the dense forests they will hardly bear tapping before the age of twenty-five or thirty years; in partially cleared forests, they can be tapped at sixteen years, while on lands from which the other growth has been removed, rubber trees begin to yield at ten years, and, if carefully treated, appear not to suffer from the tapping. The trees in cleared spaces grow much more rapidly than those in the dense forests. Without doubt the application of science would increase the yield of sap, and also the proportion of solid rubber contained in it, but this good result is not yet to be looked for. The rubber gatherers will trust to "the prodigality of nature" until all the unexplored fields have been opened and all the existing trees have been exhausted. How long that will be in the future may be imagined when one reflects that trees continue to be tapped that have been yielding rubber ever since it became a marketable commodity.

The season for tapping trees may last for three months, and sometimes six, the operation being performed daily. This is determined by the size of the trees and the richness of the yield. In some cases the trees are tapped only every other day. In others, the trees are tapped daily in the season, but only in alternate years. A rubber gatherer who owns nothing in the locality where he works sometimes taps the trees so heavily as to kill them in a single season, but such a man will find it hard to get a road in the same field again. These roads, by the way, often exist year after year, and have a rental value.

The cups used for catching the rubber milk as it oozes from the tree are now mostly of tin, though in some places cups of burnt clay are still used, being considered superior. The making of the latter requires much time, however, and they are liable to break, so that tin cups are rapidly displacing them. The clay cups are attached to the rough bark of the tree with the aid of a dab of wet clay, while the tin cups are held in place by turning down the top and pressing it into the bark. The tins could be improved by the addition of some sharp points to the back of each, to drive into the bark. The cups are made in three sizes—4, 6, and 8 ounces. The smallest size is used on the lower Amazon, the middle-sized ones in Amazonas, in the developed fields, and the largest size in virgin fields. In the latter case smaller cups are likely to be substituted before the crop is finished.

As in every other industry, there are careless, shiftless workers in rubber gathering. Such persons, when finishing their day's labor, will throw the empty cups on the ground at the foot of the trees, with the "drippings" left within. A more practical man, when he begins the season, will drive into the ground by each tree in his road a stick in which there are as many saw cuts as he has cups for the tree, while underneath is a box in which the last drop of rubber is caught. These drippings at the end of the season represent a not small item.

A rubber gatherer who is fully conversant with his business and is desirous of protecting his trees will work as follows: He will first mentally divide the lower part of the trunk—beginning about one foot from the ground and going as high as he can reach with his hatchet—into six sections, representing the six working days of the week. On Monday, we will say, he will commence work by making taps about eight inches apart around the trunk, forming a circle as high as he can reach. Under each incision he will place a cup to catch the sap; eight will be needed for a tree sixty-four inches in circumference. On Tuesday the same tree will be tapped on a circle about a foot lower, the incisions being directly under those made on the first day. By continuing this process to the end of the week, the circle of taps on Saturday will be about a foot from the ground, and forty-eight incisions will have been made,—i. e., six circles of eight taps each. The next week he will begin by tapping again in the circle of the previous Monday, but tapping between the incisions in the circle. When, after a time, no room for new incisions can be found in the original circles, new circles are started a short distance below, and thus the work of cutting into the bark is continued until the whole surface of the tree is covered with taps. It will then be necessary for the tree to rest for the remainder of the year—possibly for all of the next year. If the tapping has been properly done, by which is meant if the bark has been cut into no more than is necessary, and the wood not cut into at all, the incisions will heal over so as to leave no sign.

Much skill is needed in tapping rubber trees. Deep incisions damage the trees, but if they are too shallow, the sap will not flow. If the tapper, on failing at first to go deep enough, attempts to strike again in the same place, he is likely to miss his aim, thereby making two incisions instead of one, and chipping out a bit of wood between them, which wounds the tree. Some superstitious people try to make the cut in the form of a cross, "for luck."

Having tapped the trees in his road early in the day, and placed the cups in position, the tapper returns home for breakfast. Later he starts out with a bucket or other receptacle to collect the sap from the cups, beginning with the first tree tapped, and going over the same route followed in the morning. The milk does not run more than three hours. At the end of his road he will find himself near his hut again, where he next proceeds to smoke the sap over a fire of palm nuts.

In the case of some large trees two series of circles are described in the tapping, the upper series being reached by means of a staging built around the tree. Such treatment is likely to prove fatal to the tree, however. It is good management to avoid tapping during the flowering season of the rubber tree, which is during September. The best months for tapping are July, August, October, November, and sometimes December.

In answer to several correspondents it may be said that a personal visit to the Amazon states doubtless would prove a more satisfactory source of information than any letters that can be written from here. Life is easy in these latitudes, though somewhat oppressively de rigeur in the cities, where Portuguese customs still prevail. In the country, especially in the rubber fields, it is quite another matter. There a man may go about dressed in a light flannel hunting shirt and cotton trousers, a coat and waistcoat being superfluous. A big straw hat and high hunting boots are needed for going about, besides which one's outfit generally includes a rifle, cigars, and a bottle of quinine—the latter as a precaution against possible fevers.

* This article has been suggested by the receipt during the past year of no fewer than sixty-nine letters of inquiry from India Rubber World readers, to which paper we are indebted, and is written by Mr. M. F. Sesselberg (Para), with the idea that the information which has been asked for may prove of interest to other readers.

† The crop year is measured from the first of July.

Rubber Tires for Ambulances.

An experiment has been made recently in New York of much importance concerning the relative value of rubber-tired wheels on ambulances. Two rubber-tired ambulances have been in constant use for several weeks, one being equipped with solid and the other with pneumatic tires. The weight of each of these wagons alone, not including the weight of the driver, doctors, or patients, is 1850 pounds and it is therefore the heaviest pneumatic-tired vehicle in the world. It has been found that the rubber tires offer a great many advantages over the ordinary iron tires. It has not as yet, however, been determined whether the solid or the pneumatic tires are preferable. There is a great increase of comfort to the sick person who has to be carried over our rough streets by using the rubber tires and it is found also that the noise made by the vehicle is greatly lessened. Another important advantage is the saving in the weight of the ambulances. The ambulances have been made very heavy to give them greater stability to reduce the jolting. With the use of rubber tires the wagons may be made 400 pounds lighter, which of course lightens the load for the horses and reduces the cost of construction.

Several inconveniences have been experienced in the use of both forms of rubber tires. The ambulances are so heavy that the pneumatic tires collapse very often. And the solid tires are likely at any moment to be torn from the wheels, since the strain is unusually great. These difficulties, it is thought, however, can be remedied in time. It is as yet uncertain which form of rubber tires will be adopted, but it is certain the use of rubber in some form will be continued.

Passenger Traffic Between New York and European Ports.

During the past year 879 passenger vessels arrived at New York from European ports, 96 fewer than in the previous year. The number of passengers, however, was very much less. This is especially so in respect of steerage passengers, only one-half the number going westward, as compared with the four preceding years. The total number of cabin passengers was 92,561, and of steerage 188,164, the decrease on the former being 29,268, and on the latter 176,536. The first-class passengers were less by 24 per cent, and the steerage by 48 per cent. It therefore follows that each ship on an average carried less. This, however, applies more forcibly to the emigrant steamers sailing out from Continental ports, for the decrease in their case is very much greater than with the British liners. When the totals are compared with those of preceding years, the decrease is still more marked, and there is no question that the real cause is the restrictive measures adopted by the United States to prevent pauper immigration. By reason of extreme caution the steamship companies have not had to carry back many passengers, but the fact that some of the Continental steerage liners have only carried one-tenth or one-twelfth the number taken in preceding years indicates the effect of the law.

	Cabin.	Steerage.
1894	92,561	188,164
1893	121,829	364,700
1892	120,991	398,486
1891	105,023	445,390

Imitation of Pearl.

When nitrocellulose, dissolved in alcohol and ether, or in soda or potash-soluble glass, is spread over a surface of wood, paper, glass, porcelain, or metal, and the solvent allowed to evaporate, the film remaining is said to have the appearance of mother-of-pearl. The proportions recommended are: 1 part of nitrocellulose; 78 parts of alcohol (90 to 100 per cent); 21 parts of ether.

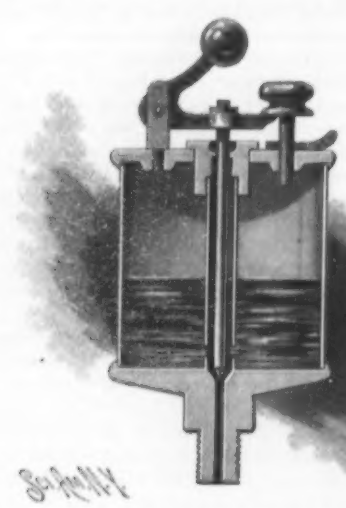
With soluble glass as solvent, 10 parts of this to 90 parts of water are employed.

The nitrocellulose may be pure or crude, or in different stages of nitrification, as guncotton, etc. Ethyl or methyl alcohol and sulphuric or acetic ether are recommended. The degree of concentration of the nitrocellulose may be varied within certain limits, which variations produce different results. The addition of bisulphide of carbon in the proportion of 25 parts to 100 of the above solution, or the addition of benzine, produces a difference in the brilliancy and arrangement of the colors of the iris developed on the mother-of-pearl-like surface.

Preserve for Binding.

AN AUTOMATIC FEED LUBRICATOR.

The oil cup shown in the illustration may be conveniently applied to any reciprocating portion of an engine, whether the part moves horizontally, perpendicularly or through any intermediate angle, or it may be advantageously used on any part having a crank motion. It has been patented by Mr. George W. Mitchell, of Lunenburg, Nova Scotia, Can. Its base is a disk like casting, with upturned marginal flange, and a shank with reduced and threaded lower end, to screw into a socket communicating with the part to be oiled. The base has a central channel communicating with an upwardly projecting tubular extension having



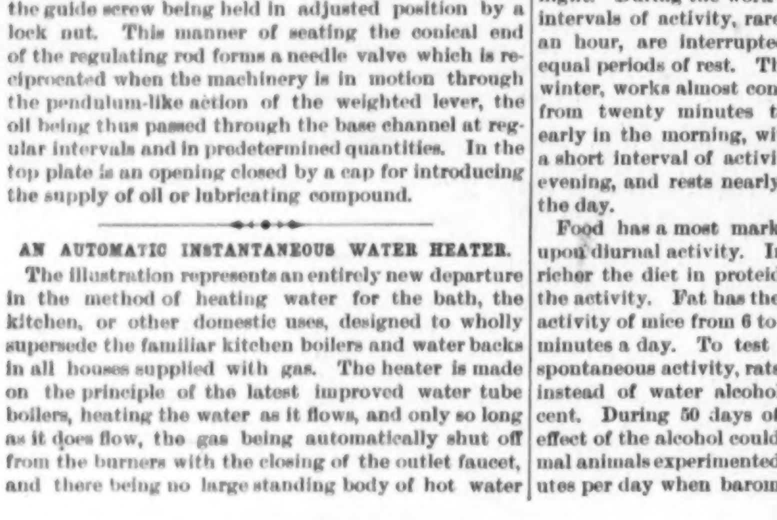
MITCHELL'S LUBRICATOR.

apertures in its lower portion, and with its upper end threaded to receive a tubular plug centrally located in a cap plate having a downwardly turned marginal flange. The body of the oil cup consists preferably of a cylindrical glass casing held within the marginal flanges of the base and cap plate. In the central tube is a regulating rod with conical lower end adapted to be seated in the beveled wall of the entrance to the central channel of the base, the rod extending upward through a packing in the tubular plug, and its upper end being threaded to receive an angular weighted lever. The lever is fulcrumed in a bracket bearing on the cap plate, being held in place on the rod by a lock nut. The lever is so arranged that it will have the same motion or power on a back and forth or an up and down movement, or a combination of both movements. To regulate the throw of the lever, a guide screw is secured in the cap plate, the horizontal member of the lever being limited in its movement by contact with the under surface of the head of the screw, the guide screw being held in adjusted position by a lock nut. This manner of seating the conical end of the regulating rod forms a needle valve which is reciprocated when the machinery is in motion through the pendulum-like action of the weighted lever, the oil being thus passed through the base channel at regular intervals and in predetermined quantities. In the top plate is an opening closed by a cap for introducing the supply of oil or lubricating compound.

AN AUTOMATIC INSTANTANEOUS WATER HEATER.

The illustration represents an entirely new departure in the method of heating water for the bath, the kitchen, or other domestic uses, designed to wholly supersede the familiar kitchen boilers and water backs in all houses supplied with gas. The heater is made on the principle of the latest improved water tube boilers, heating the water as it flows, and only so long as it does flow, the gas being automatically shut off from the burners with the closing of the outlet faucet, and there being no large standing body of hot water radiating away units of heat, making the surroundings always uncomfortable in warm weather, and necessitating double work in a range fire. The Gilbert & Barker Manufacturing Company, of No. 82 John Street, New York, have just commenced the introduction of these heaters, which are a foot wide and thirty inches long, and may be placed in a cellar or on a bracket in the kitchen, or wherever it may be most convenient to make the pipe connections. The valve arrangement is similar to that of a direct acting steam pump. In one end is a cylinder containing a piston which rises on the inflow of water from the main, on the opening of any faucet in the pipes connected with the heater, no matter how distant may be the faucet, and the movement of the piston opens a valve by which gas is admitted to burners under the heating coil, the gas being instantly ignited by a pilot light. The valves and pistons complete are about four inches in diameter and eight inches long, and the coil is of drawn copper tubing, half inch diameter and thirty-two feet long, coiled in an iron frame or box. The movement of the piston is regulated by a counterpoise, according to the pressure of water in different cities, or on different floors of a house, the regulation of the gas supply, according to its pressure and quality, being also provided for by adjustable needle valves, whereby sufficient air is likewise supplied to the bell-shaped atmospheric burner pipe. The heater may thus be adjusted to use any quality or any pressure of gas and any pressure of water. As will be seen, the supply of hot water which may be drawn from this heater is illimitable, all the water drawn through it being heated, but the heating of the water stops simultaneously with the closing of the outlet valve, the supply of gas being cut off with that of the inflow of water. By checking the faucet from which water is being drawn, a smaller quantity of water will be heated to a much higher temperature.

This heater is the invention of Mr. W. C. Clarke, treasurer of the Gilbert & Barker Company.



CLARKE'S AUTOMATIC WATER HEATER.

Activity of Animals.

Thus far the animals experimented on have been rats, mice and squirrels. They are kept in circular, easily rotated cages, so arranged that any motion of the animal rotates the cage, and by means of a tambour or levers this motion of the cage is recorded upon kymograph paper kept moving night and day. An electromagnetic circuit with a clock marks hours and minutes. We thus have the manner in which an animal divides his time between rest and activity recorded by himself. Rats and mice divide their days into about 12 hours' rest and 12 hours' intermittent work during the night. During the work period, short intervals of activity, rarely exceeding an hour, are interrupted by almost equal periods of rest. The squirrel, in winter, works almost continuously for from twenty minutes to two hours early in the morning, with sometimes a short interval of activity late in the evening, and rests nearly 22 hours in the day.

Food has a most marked influence upon diurnal activity. In general the richer the diet in proteid, the greater the activity. Fat has the opposite effect, reducing the activity of mice from 6 to 8 hours' actual work to a few minutes a day. To test the influence of alcohol on spontaneous activity, rats kept on dry corn were given instead of water alcohol of from 5 per cent to 60 per cent. During 50 days of this treatment, no uniform effect of the alcohol could be demonstrated. All normal animals experimented on tended to work more minutes per day when barometric pressure was high, and this must be taken into careful account in estimating the effect of any condition upon daily activity.—C. C. Stewart, Physiological Society.—Science.

A Thousand Dollars an Acre from Blackberries.

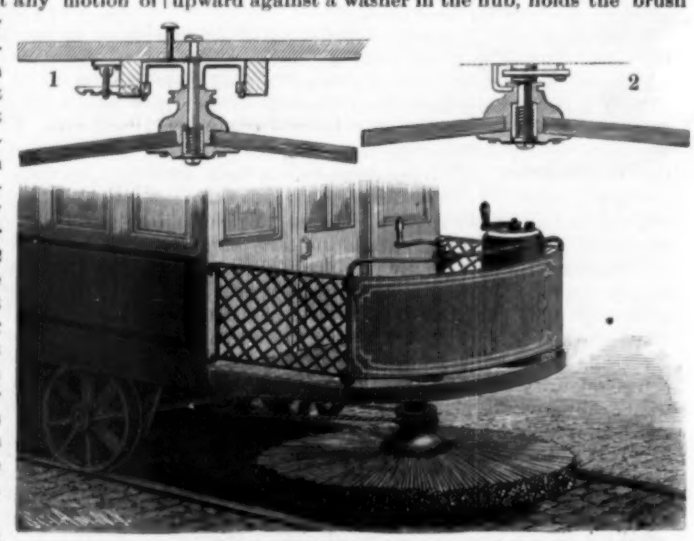
In recounting his experience, Mr. C. E. Chapman, of Peru, N. Y., said that he had heard that blackberries would grow anywhere, and he, therefore, bought some plants of Kittatiny, took no particular pains to set them, and many died. He used on the ground a quantity of raw, coarse manure, and the next year many of the canes broke. He then concluded that to grow blackberries required some study. As a result of the study he prepared a piece of chestnut loam, put it in prime condition, bought some plants of Agawam & Snyder from good, careful growers, at prices that would warrant him in expecting good plants. He set them carefully in trenches seven feet apart and eight inches deep in the trench. He found these varieties deep-rooted and thrifty, and where mulched, pruned and not fed too much raw manure, he had little trouble from winter killing. When setting his plantation he applied eight hundred pounds of potash to the acre. He was careful to have all plants well set, and he frequently clipped the tops. All weak canes were cut out. Every spring he applies a light dressing of commercial fertilizer. Immediately after fruiting he cuts out and destroys all old canes, as these are the seat of nearly all the troubles of this fruit. In the winter he mulches heavily and leaves the mulch on late in the spring to prevent early starting.

Although he did not believe a thousand dollars an acre could be realized under ordinary conditions, yet this was an achievement worth striving for, and small patches had been made to yield at that rate. It required the right combination of man, soil, variety and cultivation, but it could be done.

A REVOLVING BRUSH CAR FENDER.

The decidedly novel means represented by the illustration for averting danger to pedestrians from fast running cable and electric cars forms the subject of a patent recently issued to Messrs. Andrew Mohn and August J. Bothur, of No. 131 Bloomfield Street, Hoboken, N. J. A revolving brush, of a diameter to cover the roadway to the outer side of each rail, is held under each end of the car, the brush being revolved by a mechanism connected with one of the car axles, or, in the case of trolley cars, by a separate electric motor, if desired. When revolved from the axle, as represented in the transverse sectional view, Fig. 1, the hub of the brush is journaled on a vertical shaft secured to the platform, and on the hub is a pulley connected by a belt with a loose pulley on the car axle, the latter pulley being adapted to be locked to the axle by a simple form of clutch moved by a shifting lever. A coiled spring on the lower end of the vertical shaft, pressing upward against a washer in the hub, holds the brush normally at a little distance above the track, but the brush may be readily moved down into contact with the top surface of the track by pressure upon a pin extending up through the platform, and bearing upon a vertically sliding frame having a central tubular boss resting upon the upper end of the hub. When the motorman or gripman ceases to press upon the pin the brush is raised by the spring to its normal position. When an electric motor is employed for driving the brush, the vertical shaft is replaced by a shaft rotated from the motor, and, as shown in Fig. 2, a change is made in the frame by which the brush is moved downward, although the movement is similarly effected by pressure upon the pin extending up through the car platform. The improvement is also designed to be especially valuable for clearing tracks of snow and ice.

1 2



MOHN & BOTHUR'S CAR FENDER.

"MALARIA a Water-borne Disease" was the title of a paper read by Dr. W. H. Daly, of Pittsburg, at the recent meeting of the Mississippi Valley Medical Association at Hot Springs, Ark. The author said, in summing up the evidence in a given case of so-called malaria, it is important to remember that the water vehicles of malaria may include contaminated land water, taken into the stomach on the stalks of celery or on the leaves of lettuce, or it may find its vehicle in the rinsing of milk cans with malaria water, or in the adulteration of milk with contaminated water containing the Laveran germ. The cistern water stored under the earth may be easily contaminated by the earth water containing the germ, if the cistern itself is cracked or otherwise inefficient.

AN ANCIENT ROMAN CITY IN ALGERIA.

Second only in antiquarian and historical interest to the discoveries at Pompeii are the ruins of the ancient Roman colony of Timegad, or Timegatte, in Algeria. The city lies among the spurs of the Atlas Mountains, about fifty miles due south of Constantine, and the same distance northeast of Biskra. It was known in Roman times as Thamutuda, Thamugas, and Tamugada, and must have been a place of some importance, for the ruins are about three-quarters of a mile in width and very nearly a mile and three-quarters in length, if we include the Byzantine fortress and the tombs cut in the rocks close by. The city was formerly the center of a wide stretch of fertile country in the center of the granary of the empire, and was also a military station of great importance, by which the mountain tribes of the neighboring Atlas were held in check. Through it ran six Roman roads, connecting it with Lambessa, Diana Veteranorum, Constantine, and other flourishing Roman colonies; and it has been conjectured that the veterans of the thirtieth legion were established here in recognition of their services in the Parthian war, A. D. 106. The country round is now utterly deserted, and there are no inhabitants near the spot, the nearest Arab settlement being some miles off. During the latter empire Timegatte was a very flourishing city, and during the fourth century was one of the great African centers of religious agitation. Many of its bishops were celebrated men, and Optatus, who was head of its church at the end of the fourth century, was regarded as the chief of the Donatists, the strictest among the sects of the church in Africa.

Timegatte seems to have been ruined and deserted about 500 A. D., but the citadel was rebuilt and the city again inhabited toward the middle of the sixth century; and when the Arab invasion took place it was a Christian town, and possessed a church built after the restoration of the city. However, owing to the disturbed state of the country, at the fall of the empire the city was again deserted.

A number of statues, inscriptions, and earthenware vessels are scattered about the ruins, and the houses which are still standing enable us to reconstruct the different quarters of the town without any very great difficulty. The monuments still left in more or less preservation are situated to the north of the water-course which intersects the plain. They are: the Forum, which has an imposing appearance, with its pavement still intact, its tribunes, its inscriptions, and its columns, which supported a long colonnade running from north to south, and looking out over the fertile valley at the foot of the mountains; the temple, a remarkable ruin full of curious detail, which is supposed to have been a temple to Jupiter; the theater, which still remains in a very fine state of preservation, and is situated on the slope of the hill against which the city is built; a gateway in a half ruined condition; a smaller temple; and the principal street, which is a fine broad thoroughfare flanked on either side by magnificent columns, and terminating in a triumphal arch. This arch is in an almost perfect state, and is one of the most important monuments of the Roman period existing in Algeria. It has three openings, the larger one in the center, and a smaller one on each side, with a niche for a statue above it. Four fluted columns with Corinthian capitals flank the openings, and an entablature connects the pillars and arches. Our engraving shows what remains of this triumphal arch.—The Graphic.

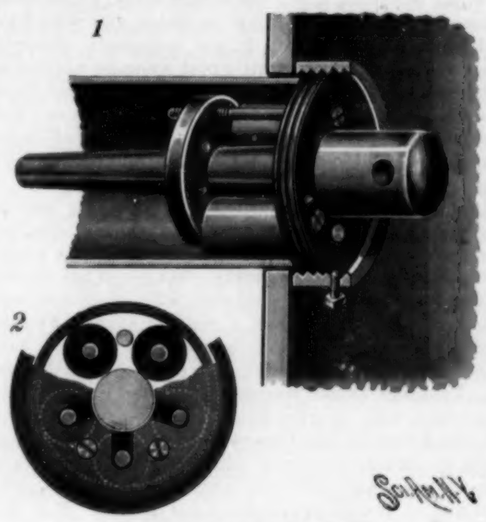
THE ROMAN TRIUMPHAL ARCH AT TIMEGATTE.

Copyright in Photographs.

A decision by an English court has determined the rule as to photographic portraits. The copyright belongs to the sitters when they order the portrait and pay for its being taken. The only claim for copyright by the photographer is when he invites sitters to have their likeness taken, and when they assent to sit without payment, doing so for purposes of publicity or advertisement.

AN IMPROVED FLUE EXPANDER.

For quickly and conveniently expanding boiler flues in place in the flue sheet, to prevent leakage, the implement shown in the illustration has been devised and patented by Mr. David W. Patton, of No. 914 Concannon Street, Moberly, Mo. Fig. 1 represents a side sectional view of the improvement, and Fig. 2 is a face view of the outer head, the stock consisting of an outer and an inner head. In the outer head are re-



PATTON'S FLUE EXPANDER.

cesses extending radially from a central opening and in the inner head are aligned slots, the slots and recesses receiving the trunnions of five rollers, arranged between longitudinal rods connecting the two heads. The central apertures in the two heads form a passage for a tapering mandrel, whose outer head is adapted to be taken hold of by a suitable tool to force the mandrel inward, at the same time pressing the rollers outward and rotating them. When the mandrel is withdrawn, the rollers may be readily taken out of and replaced in the stock. The outer head forms on its inner face an abutment for the projecting end of the flue or pipe to be expanded, and on this head screws a sleeve secured in place by a set screw, the inner edge of the sleeve abutting against the outer face of the flue sheet, and the sleeve being adjusted inward or outward as desired.

Paper Trays and Battery Jars.

An inexpensive photographic tray or battery cell, which is practically water, acid, and alkali proof, may be made out of a pasteboard box by covering it with a coating made by melting together equal parts of paraffine and guttapercha chips. The guttapercha should be melted first over a slow fire, the paraffine is then added and the whole composition thoroughly mixed and brought to a very fluid condition. It is then poured into the box or box cover, which should be dry and warm. The composition should be allowed to run along the edges, so that the entire inside of the box is waterproofed, the excess is poured off and the box is then allowed to cool. The outside should then be waterproofed in the same manner. In case any spot fails to receive the composition, some of it may be made into sticks and applied to the bare places with the aid of a hot iron, which may also be used to smooth up any unevenness of the surface. Some photographers like ridges in the tray to keep the plate off the bottom and to facilitate in lifting it out. These ridges can be easily built up with the aid of a hot iron. These pasteboard trays are light and are not liable to be broken by a fall. Old dry plate boxes may be utilized for this purpose. Wooden trays may be waterproofed in the same manner and can be used for batteries if desired.

Modern War Ships.

Old-fashioned naval officers have a habit of comparing the new ships with the old, to the disadvantage of the former.

The deck of the modern man-of-war is no longer a broad, open space up and down which the eye may roam, seeing all that goes on. It is cut up by all sorts of contrivances having relation to the business of the craft, so that one really sees at any one time only a little corner of the deck. As for the officer of the deck, he in many ships now walks aloft on the bridge out of communication with his fellows, a solitary figure, able, indeed, at a touch of the electric bell, to set in motion the most powerful machinery of modern warfare, but no longer able to exchange a friendly word with his fellows.

There is one serious drawback to the modern steel ship that is not the result of any mere sentimental consideration, and that is the deathlike coldness of the interior. It is possible, indeed, to warm the ship with steam, but nothing can warm the sides in cold weather, and the man that sleeps near the unsympathetic steel is liable to contract rheumatism in an unconscious effort to warm it by the sacrifice of his own vital heat. The closed air port drips icicles and the seaward wall of the state room is as cold as an ice box.

The Largest Steamer Company.

The North German Lloyd—Norddeutscher Lloyd—has from a small beginning worked its way to the very front, being now the largest steamer company in the world. The company enjoys a subvention from the German empire for five lines, on the condition that the steamers call at certain ports, that the mail-carrying boats shall be built in German shipyards, and that the speed be at least twelve knots. The company capital is now 83,000,000 marks, or about $20,750,000, and its fleet consists of 83 steamers of an aggregate tonnage of 242,367 tons, besides tugboats. The company's traffic comprises 22 lines, viz., 8 European, 6 North American (twice weekly from Bremen to the United States), 2 South American, 5 to Eastern Asia, and 1 Australian. The staff of the company consists of 8,000 men, and in the year 1873 there was formed a seamen's and pension fund, by donations and an annual charge of 2½ per cent of the pay. The captains have to pass through the various degrees, and if there is an accident, they have to resign.

Gas of 240 Candle Power—Acetylene.

The time was Wednesday, January 16; the place, the well known lecture theater of the Society of Arts, London; the man, Professor Vivian B. Lewes; and the matter, commercial acetylene. From this combination resulted, then and there, a sensation which, unless appearances are utterly illusory, will echo and re-echo through the industrial world for a very long time to come. When the announcement was made that Professor Lewes would read a paper on "The Commercial Synthesis of Illuminating Hydrocarbons," no indication was given of the particular turn which the communication would take; but that a high degree of interest and importance would be found to attach to Professor Lewes' matter was foreshadowed by the steps taken, with the co-operation of Sir H. Trueman Wood, the secretary of the society, to secure a fit audience for the occasion. In consequence of this effort, a goodly contingent of gas engineers and others interested in the gas industry put in an appearance at the society's house last Wednesday evening; but it is not to be supposed that a single individual among this critical portion of the audience had the faintest expectation of what was coming, or entertained the slightest idea that he was about to assist at what will, in all probability, come to be regarded throughout the gas and the allied interests as an epoch-making demonstration. Professor Lewes' and the society's secret was perfectly kept; and its disclosure at the proper time was, therefore, all the more astounding. For his design was no other than the first exhibition to the world of one of the most striking of the fruits of modern scientific discovery in the new territory of physico-chemistry, the product of that remarkable research of Mr. T. L. Willson—carbide of calcium—the nature and properties of which were, by a pure coincidence, described in our last week's "Technical Record." The absorbing interest of this programme, and the brilliant manner in which it was carried out, are not likely to fade from the minds of those who had the good fortune to attend on this historic occasion.

What Professor Lewes said will be found reported in full in another column. Our present purpose is to draw attention to the text of the paper, and to supplement it with independent testimony as to the demonstrations by which the lecturer proved his statements. He commenced by laying out the ground for the structure he was about to raise, inviting the attention of his audience to the twin methods of chemical research, analysis and synthesis, to make it quite plain that he was not going to ask them to take from him anything arrived at by occult means, or needing to be hedged about by the devices of charlatanry. Only too often, in the history of so-called new discoveries in chemical industry, there is something kept back. The result, whatever it is, is stated to be attained by the employment of some "chemical," the nature of which is not disclosed. Of course, a man of reputation in science does not mix himself up in such schemes; but things of this kind occur often enough to point the observation we now offer regarding the transparency of Professor Lewes' exposition. And when the lecturer had, by easily followed steps, arrived at the top of the first stage of his structure—the announcement that it was the synthesis of acetylene in bulk which it was his purpose to deal with—he was careful to show that there is nothing absolutely new about carbide of calcium, or the phenomenon of its giving off acetylene when wetted with water. He carefully told the story of the early experiments with this compound; and only "let himself go," in the capacity of the exhibitor of a new thing, when he came to deal with the production and uses of it on a commercial scale by the method of Mr. Willson.

And a very startling exhibition it was—as utterly fresh and convincing as good matter in the hands of a master in the art of science exposition could make it. Carbide of calcium, as known to science, was a chemical curiosity until Mr. Willson happened upon a way of preparing it in bulk in the course of his experiments upon the manufacture of calcium alloys by the agency of his electrical furnace. But this discovery put a new face upon the compound. When an article that has only existed in grains comes to be turned out by the ton, it is, to all intents and purposes, a new article. In this sense, carbide of calcium is very new indeed; and its industrial possibilities are newer still, inasmuch as only the most direct and obvious of these developments have as yet been so much as hinted at.

Take it that the material can be produced by the ton, and it is impossible to surmise what chemical industry will be able in the fullness of time to make of it. The product of fusing together, in an electrical furnace, such common materials as lime and carbon in any suitable form was exhibited by Professor Lewes as a greenish-gray stone-like substance greatly resembling the commonest description of serpentine rock. When kept in the air, a light coating of lime soon forms on its surface. Upon handling it, a faint, unpleasant odor, suggestive of garlic, and also not altogether unlike the familiar reek that emanates from the ironwork of an old gas purifier, manifests itself. To all appearance, it is a dull, inert stone, devoid of any other properties than those of common road metal, and not more likely to be credited by the casual observer with gas-yielding capabilities. Upon a piece of this material, Professor Lewes sprinkled a few drops of water from a wash bottle, and put a lighted taper to it. The nascent gas—acetylene—immediately ignited with more than the brilliancy of the pitchy flame of highly bituminous coal in an open fire, and continued to burn fitfully over the wetted surface until all the water was gone. Then came the display of the same gas evolved in a jar (standing upon the lecture table) which contained pieces of the carbide in water, and stored in makeshift glass holders. It was a dramatic denouement of Professor Lewes' little plot when he applied a light first to a single open flat-flame burner, and then to a group of five similar burners, and people saw for the first time, in a public place, the intensely brilliant, white, and solid-looking flame of burning pure acetylene.

It is indeed a flame to wonder at. Nothing like it ever before came within the ken of a gas manager or dazzled the vision of a photometrist. There is something startling in the suggestion that gas of 240 candle power—calculated, in accordance with photometrical practice, upon the basis of a consumption of 5 cubic feet per hour—can be burnt by means of an open flat-flame burner. When the carbide of calcium first came into Professor Lewes' possession this had not, in fact, been done, and, in order to get a flame of acetylene at all, the American handlers of the gas had fallen back upon the brutal device of diluting it with a certain proportion of air. This was to repeat the crude American way of rendering naphtha gas usable. But the dilution of acetylene with air is even more objectionable than is the same treatment in regard to naphtha gas, inasmuch as it is more easily converted into a violent explosive mixture. Professor Lewes, in succeeding in burning acetylene in the pure state in which it comes from the mixture of calcium carbide and water, has saved its prospects as an illuminant. He showed on Wednesday those wonderful acetylene gas flames already mentioned, each produced by burning the gas as made in the simple way described, without any adventitious mechanical or chemical aid, after the rate of half a cubic foot per hour, and stated to yield a measured illuminating power of 25 candles. This could easily be credited. But what it is more difficult to convey in mere words is the impression of steadfastness, whiteness, and, so to speak, solidity which the flames in question made on the observer. At a little distance, no non-luminous zone could be perceived; but, on a close inspection, a tiny speck of blue over the top of the burner was visible. No smoke or smell escaped from these flames, which, although exhibiting in their color the evidence of intensely active combustion, were found to be much cooler than oil gas or albo-carbon gas flames of the same size. This is a most striking feature of free-burning acetylene. The incandescent electric lamps, of normal brilliancy, by which the lecture theater was lit were made to look as dull as "red-hot hair pins" by the aggressive acetylene, which itself, by virtue of the irradiation produced by its dazzling white flame, appeared to form balls of almost blinding light when viewed directly in face or sideways of the flame. The mantle of the incandescent gas light is no whiter than, if it is so white as, the naked acetylene flame, which does not flicker or change color; but, in the absence of means of making a direct comparison between the two lights, it is rash to say which would bear the palm for purity of tint.

It is not for us to say what may be done with this new servant of a community that ever clamors for more light; and gets it more easily and cheaply every day. Considerations of the cost at which the carbide of calcium will be producible, and of the prospects of its utilization as a means of generating portable gaslight or as an enricher of common coal gas, suggest themselves to every one who sees or hears of the substance and its qualities. But it is premature to discuss such questions at present; all that need be said upon these points for the time being was said on Wednesday by Professor Lewes, and by those who took part in the extremely cogent little discussion that followed his brilliant discourse. When the time is ripe for more, it will doubtless be forthcoming. Meanwhile, it is only doing justice to all the parties concerned in last Wednesday's memorable proceedings in the Adelphi to acknowledge the high interest of the whole subject, and the adequate manner in which it was presented to the general and technical public. The discoverer of the system is to be congratulated upon the promise of the new industrial development; Professor Lewes may be complimented upon the deft and convincing way in which he performed the part of introducer of the novelty; and—if last, not least—the Society of Arts deserve to be credited with having proved once more the practical value of the agency, wielded by the council and the secretary of this useful institution, for giving publicity readily and promptly to warrantable novelties in science and the industrial arts.—Journal of Gas Lighting.

[Professor Lewes' lecture in full is given in SCIENTIFIC AMERICAN SUPPLEMENT, No. 998.]

A St. Louis Fast Line.

An extract from the Detroit (Mich.) Advertiser of November 7, 1839, gives an account of a fast through passenger service which was then established between New York and St. Louis in the following terms:

"It is no longer to be doubted that the lake route from St. Louis to Buffalo and New York is equally the cheapest and most expeditious. This fact begins to be very generally conceded, and the large number who already prefer it to all others is an argument conclusive that very soon no other route will be thought of, either by men of business or pleasure. For the information of those who may hereafter wish to make the trip, we have procured and herewith publish the time necessary to make the trip from New York to St. Louis:

From New York you, of course, take the steamboat to Albany, say	12 hours
Railroad to Auburn	12 "
Swiftsure line to Rochester	8 "
Railroad and stage to Buffalo	9 "
Steamboat to Chicago	5 days
Stage to Peru	12 hours
Steamboat to St. Louis, good water	24 "
Total time	8 days 5 hours

"Thus, in eight days and five hours the entire distance from New York to St. Louis can be traveled by the way of the Western lakes! With these facts before them, who will hesitate to choose between the different routes open to St. Louis? Looking at this route just as it is, we cannot conceive it possible that any other route can be long thought of. But it is, nevertheless, susceptible of improvement, and this improvement will be effected when the railroad is completed from this city to St. Joseph. That road will save nearly two days' time, and the entire journey may then be made in a trifle over six days.

"Thus is Yankee enterprise annihilating space and bringing the two extremes of the new world into close approximation."

Ship Building Wages Here and Abroad.

In an interesting paper recently made public by Mr. C. H. Cramp on the above subject, he gives the following comparative table of wages now current in this country and in Great Britain, in occupations pertaining to ship building.

	American rate per week.	British rate per week.
Patternmakers	$18.00	$9.00
Machinists	15.00	8.50
Boilermakers	15.00	8.50 to 9.00
Chippers and calkers	15.00	7.80
Riveters	12.00 to 14.00	7.50 to 8.00
Beam and angle smiths	15.00	8.40
Fitters up	15.00	7.80
Ship carpenters	18.00	9.60
Joiners	16.50	9.00
Painters	18.00	9.00
Coppersmiths	18.00	8.60 to 9.00
Shipshed machinemen	15.00	7.20
Furnacemen	11.00	6.00
Holders on	9.00	4.20 to 4.80
Riggers	11.00	7.00 to 7.20
Plumbers	18.00 to 19.00	9.00 to 9.60
Drillers	11.00	6.40
Sheet iron workers	15.00	8.50
Moulders, iron	14.50	9.00
Moulders, brass	15.00	9.00
Laborers, as helpers	9.00	5.20
Laborers, as handlers	8.00	4.20

Purification of Water.

In 1873, when preparations were being made for the Ashantee war, Dr. Crookes was requested by the Army Medical Department to suggest a mode of protecting our troops against the use of the highly impure waters of the Gold Coast.

After some experiments on polluted waters, he recommended as an addition to the impure water the following mixture:

Calcium permanganate	1 part.
Aluminum sulphate	10 parts.
Fine clay	30 "

This mixture, in the proportion of 1 c. c. to 10.000 parts even of London sewage, effects a rapid purification.

The addition of the other ingredients along with the permanganate has the object of expediting the process and of precipitating other impurities and living organisms upon which permanganate alone has no immediate action. It was found that moving organisms survived for more than a day in an intensely red solution of permanganate. This latter fact, however, though it shows that permanganate is of little use for soldiers on the march, does not disqualify it as an addition to the reservoirs and clarifying beds of a municipal water supply.

Remedy for Insect Stings.

A paint for the stings of insects, in which ammonia is kept in close and prolonged contact with the affected part, is prescribed as follows:

R. Aq. ammoniæ	m cl.
Collodion	gr. l.
Acid salicylici	gr. v.

A few drops to be applied to each bite or sting.

—Medical Chronicle.

Effects of Strong Electrical Currents.

M. Bernhardt, in the Centralblatt fur die Medicinischen Wissenschaften, has collected several instances of death by electricity. In one recorded by Dr. J. Kratter a man aged twenty-six was traversed by a current of high tension—1,600 to 2,000 volts—and was found breathing stertorously a few steps from the point where he made contact. Death soon took place. The post mortem examination, after the lapse of twenty-one hours from the time of death, disclosed two small wounds—one on the left index finger and the other on the back—and there were large extravasations of blood in their vicinity. All the organs of the body showed hypervenous blood, acute œdema of the lungs was present, and there were extravasations into the sheath common to the carotid and vagus, along all the vertebræ, into the intercostal spaces, around the œsophagus, beneath the peritoneum and elsewhere. The muscles of the body were in an extreme condition of rigor mortis; the heart was partially relaxed. No macroscopic changes could be seen in any part of the nervous system.

Kratter thinks that the electrical shock suddenly paralyzed the heart, which was the immediate cause of death, accompanied by œdema of the lungs causing hypervenosity of the blood. There was a marked contusion on the left side of the diaphragm at the point of contact of the heart. Experiments made on animals showed that in them the respiration was usually primarily arrested, which caused asphyxia and secondary stoppage of the heart's action, though sometimes the heart was first affected.

In a second case, reported by M. D'Arsonval, a man was struck with a current of 4,500 volts (the ampere meter indicated 750 milliamperes). The current entered at his hand and issued at his back. Half an hour or more elapsed before any attempts at resuscitation were made, but on artificial respiration being practiced on Silvester's method, recovery took place.

Lastly, Dr. Donnellan reports a case of the passage of a current of 1,000 volts through a man, which instantly caused coma, dilated pupils, pallor of the face, and sweating; delirium, and tonic alternating with clonic spasms followed. The pulse was 80. The respiration, at first stertorous, passed into the Cheyne-Stokes type. After the injection, first of morphia and then of strychnia, the patient fell into a deep sleep, from which he awoke convalescent.—Lancet.

Eye Mistakes.*

Conversation with other physicians convinces me that there is more real misunderstanding regarding the import of eye symptoms than concerning those of any other portion of the human body. Why this is so I can hardly apprehend, unless it comes from the fact that so many eye troubles are purely mechanical, and so are outside the sphere of ordinary medical thought and study. To many the eye seems also to be a mystery into whose sacred precincts they fear to enter, and the mechanical and optical principles which to the oculist seem so plain and easy are entirely overlooked or but dimly grasped by the general practitioner. This fact will be illustrated by the following common mistakes that are made regarding eye troubles.

One very common mistake is that of belittling the importance of ophthalmia neonatorum. Many are the children who have either been entirely blinded or have had their eyesight impaired for life by reason of carelessness or neglect. It is important that proper measures be taken to prevent its occurrence, for it is to a large measure a preventable disease. The physician should always know by inspection the exact state of the cornea in these cases, so that proper measures may be taken to prevent any impairment of its transparency. Unless a physician feels that he has the knowledge and is competent to treat such cases, he should call to his aid one who does know how.

Regarding the selection of glasses, the gravest mistakes are made. I frequently meet physicians of good general ability and large practice who not only encourage their patients but they themselves set the example of selecting such glasses as they seem to see best in, from any vendor that happens along, or into whose shop they chance to stray. In this respect they treat the eye with less consideration than they do their backs, since every one knows that to secure a comfortable and well fitting coat it is necessary that first there shall be definite measures made with the eye. They will put on glasses thus without any definite measurements whatsoever.

Now the simple truth is that proper measurements of the eye cannot be made by simple tests of the sight. The eye is an optical instrument set for seeing things far away, but provided with a focusing apparatus (the accommodation) by which it automatically can adjust itself to near objects. This power is a muscular one and is entirely involuntary. The eye always adjusts itself for the best seeing of any object at its distance.

It is just this fact that vitiates all attempts to measure its defects. It is like trying to measure the length of a rubber band that is constantly stretching and contracting. Hence it is that it is simply impossible to measure the refractive errors of the eye by any of the ordinary tests at the disposal of the opticians and spectacle venders. Every eye that needs a glass at all needs first of all to have its optical status accurately measured by an oculist who alone is able to determine what methods and means and drugs (mydriatics) are necessary and safe.

I suppose one reason why this truth is not really believed is because when the oculist utters it, it looks as though it was a scheme on his part to increase his business. This again is an error, for if every person were thus examined for glasses upon the first evidence of eye strain, a great mass of eye troubles would be prevented and the oculist's business would be immensely lessened. I will only mention in illustration that in this way those banes and specters of advancing age, senile cataract and glaucoma, would become almost unknown, since they are most probably always more or less directly the result of eye strain.

Another phase of eye mistakes is illustrated by the remark of a very able practitioner. He was speaking of a school wherein, through the vigilance of its teachers, a large proportion of the scholars were wearing glasses. His remark I cannot repeat, but it was made with a covert sneer, and the caustic hint that probably many of the children did not need them at all. Now I don't believe there are any oculists who are prescribing glasses when not needed. I have never found such a person nor such a patient so treated. The truth is that the error is all the other way, and that many eye defects of low degree are not corrected as they should be. The oculists have erred on the side of too few rather than too many spectacles. It seems difficult for the laity and even the practitioner of medicine to realize the enormous strain that modern civilization is placing upon the eye. It follows as certainly as does the day the night, that there must be an increasing amount of attention paid to the preservation of the sight, and congenitally defective eyes can and must be corrected by glasses to a much larger extent. But please remember all such work must be done upon a basis of accurate measurements. All other attempted corrections are worse than useless, and it is the duty of physicians to so warn and instruct their patients.

Grave mistakes are commonly made regarding the fitting of the frames for glasses. All frames ought to be so accurately centered and adjusted that the line of vision should be through the optical center of the lens, excepting, of course, those few cases in which the oculist purposely decenters in order to obtain prismatic effects. In other words, the center of the pupil of the eye should be behind the center of the lens. All cylindrical glasses must also be held at definite angles, and any deviation therefrom is disastrous. Unfortunately, well fitting frames are the exception and not the rule, with the result that the best selected glasses fail to relieve, and may, indeed, increase eye strain. To this may be added the deplorable fact that the cosmetic effects of ill-fitting frames are such as to enhance the natural aversion to the wearing of spectacles. Observation of the frequent manifest disfigurement of the features of such persons deters many ladies especially from thus wearing these much-needed helps. As a matter of fact, I think well-fitting glasses really add to, rather than detract from, the beauty of the features.

Quite a frequent mistake is made by practitioners regarding the import and cause of the various inflammations of the margins of the lids, such as blepharitis and herdeolum or sties, etc. Physicians go on prescribing for recurring attacks of these troubles, forgetful of the fact that their development is, in the great majority of cases, due to eye strain, and that it is glasses, and not medicines, that are needed.

Grave mistakes are very commonly made in the treatment of phlyctenular conjunctivitis. The first thing to be done is to remember that dietetic errors are always present, and that no good results will be obtained without a strict and carefully regulated diet taken at regular intervals. It must not be forgotten, also, that in addition to well selected constitutional remedies, atropine instillations will be required when photophobia is excessive.

It is easy to make serious mistakes in the diagnosis as well as the treatment of iritis and glaucoma.

Let me enumerate the classical symptoms which ought to lead to a certain diagnosis of iritis: Ciliary neuralgia, ciliary and subjunctival injections, showing fine, deep vessels radiating outward from cornea in straight lines, a discolored and sluggish iris—these point unmistakably to the trouble. And now comes the greatest and very common mistake of general practitioners in its treatment. Atropine is either neglected or given hesitatingly and in too weak solutions. It must be used early in sufficient strength to produce complete dilatation, or the eye will be more or less permanently ruined by adhesions of the iris to the lens. The only exception to this rule is the evidence of a beginning glaucoma, when atropine must be used cautiously, if at all. The differential diagnosis of iritis from glaucoma is not always so easily made.

The following are the chief diagnostic points of glaucoma in the order they will be likely to be observed: We will first notice that the pupil of the affected eye is dilated larger than the other eye, and that it is fixed, inactive, will not respond to light. The patient will complain of seeing a halo of rainbow colors, the outer ring being red and the inner bluish. It will be found that the cornea is lacking in sensibility, and this will lead to a test as to the tension of the eyeball, which will be found increased. An examination of the fundus will then be made for the characteristic cupping of the disk. To these symptoms may be added enlarged ciliary veins. A shallow anterior chamber, which can be easily made out by a side view of the front of the eyeball, and impairment of the right pons, are usually present, and are sometimes the most marked symptoms leading to the erroneous diagnosis and treatment for a simple neuralgia. But pons is not always a prominent symptom, as is commonly supposed, at least in the earlier stages, when a diagnosis is most valuable.

It is a grave mistake to overlook and neglect these cases and no physician should attempt to treat them without a thorough knowledge of the benefits and limits of an iridectomy, which alone, in many cases, can save the sight.

* By E. M. Howard, M.D., Camden, N. J. Read before the New Jersey State Homeopathic Medical Society, and reported in the Hahnemannian Monthly.

Saturated Waste for Oiling Cars.

Mr. B. Haskell, superintendent of motive power on the Chicago & West Michigan and the Detroit, Lansing & Northern Railway, is using burlap for packing tender and engine truck boxes. The material is the burlap or sacking that the baled waste is wrapped in. The material is springy and will not mat. Its elasticity keeps it up in contact with the journal and its texture permits the oil to pass through it freely. The material is cut up quite fine preparatory to use. Mr. Haskell writes the Railway Engineering and Mechanics that he finds it to be equally as good as woolen waste and it has the advantage of costing nothing. He furnishes his trainmen with saturated waste instead of oil for oiling cars. To prepare this waste he has built a special tank. It is circular and will hold about six barrels of oil. A coil of steam pipe is run around the inside of the tank, and a shelf of stack netting is secured on one side. About two barrels of oil is put in the tank and waste enough to absorb that quantity of oil. Steam is then turned on and the oil heated slightly, making it thin enough to be absorbed readily by the waste. It is then allowed to soak for at least twenty-four hours, and after being again heated, the waste is put on the shelf to drip. The second heating is to make the waste drip more quickly than it otherwise would. A little experience in heating the oil will enable the operator to prepare it so that the oil will drain from the waste without any handling or pressing. It has been found so convenient that since the plan has been adopted the trainmen are not given oil, but saturated waste instead, and the cost of oiling cars has been greatly reduced thereby.

Ancient System of Manufacturing Salt in Mexico.

Mr. James Mactear describes, in a recent number of the Journal of the Society of Arts, a very ancient method of manufacturing solar salt, which is still carried on in Mexico, near a village called Ixtapa de la Sal, in the State of Michoacan. The village lies at an elevation of 4,200 feet above the sea in a volcanic district, and brine is found at various points oozing from the rocks and in pits which are dug for the purpose of collecting it.

The method of evaporation is very curious and interesting: the small hills are terraced, and on the broad steps thus formed flat-topped stones or bowlders, chiefly of a black close-grained volcanic rock, are carefully arranged and leveled. On the flat surface of each of these stones a small ring of clay is built up about an inch high, and in the small vessel thus formed the brine is evaporated. There are many thousands of these to be seen close to the road. The evaporation takes about four days, the little vessels being filled from time to time by men who carry the brine up from pits in the valley in large earthenware jars. The salt is of very large grain and, as might be expected, rather dirty in appearance; but the production of the district is very considerable, and the method dates back to time immemorial.

Home Made Powder.

The Naval Ordnance Bureau is greatly gratified with the excellent results it is obtaining from the 6 inch samples of smokeless powder, manufactured at the government manufactory, Newport. This powder was fired in a 6 inch gun, 40 calibers in length, with the ordinary charges and ordinary weight of projectiles. It gave a velocity of 2,344 ft.-sec., with 12·6 tons pressure in one round; 2,407, with 13·8 tons pressure, in a second; and 2,495, with 15·1 tons pressure in the third. Altogether this is very gratifying, and the experts are proud of it.

THE ADVERTISING TRICYCLE.

The machine represented herewith opens up a new horizon in the vast domain of advertising, in which it seemed impossible to realize still another innovation.

As may be seen, it consists of a tricycle whose hind wheels, P and P', with very wide rims, are covered with a rubber tire that carries in relief the advertisement that it is desired to make known.

It will be at once seen that such advertisement must be quite short (formed of two or three words, for example), so that the letters may be given as large dimensions as is compatible with the width of the wheels.

Above the wheels there are placed two inking rollers, A and B, that communicate with the reservoirs, R and R', through tubes, C and C', provided with cocks, r and r'.

Through the intermedium of a small pulley, L, and a cord, b, the axle of the pedals actuates a small blower, V, fixed upon a small shaft supported by the frame of the reservoirs. This blower sends air into the tubes, T and T', which drives away the dust from in front of the motive wheels. The system of tubes, K and K', supporting the inking rollers is controlled by a cord, a, attached to the extremity of the lever, E, which the cyclist can cause to tilt in such a way as to establish a contact between the roller and the tires. The reservoirs, R and R', are supported by the rear axle. The other parts of the machine do not differ from those that exist in the ordinary tricycle.—Revue Universelle.

California Scale.

In the last bulletin from the New Jersey Experiment Station, Professor Smith gives an account of the spread of this scale in New Jersey, where it was introduced upon Kelsey plum trees imported from California, and probably from Idaho pear stock received from Western nurseries, and it has spread until it is known to have infested at least a hundred places in that State, and it is not safe to assume that it is absent from any orchard which has not been examined. This scale belongs to the group of armored scale insects, and a complete account of its life history and of its methods of spreading are given in this bulletin. Naturally it moves very slowly, but as it will crawl upon winged insects and the feet of birds, as well as upon ants, which are great travelers, it is sometimes carried great distances. It is probable that all rosaceous plants will support the species, although it prefers some varieties to others. The recommendations in the bulletin are that every orchard set out during the last six years should be thoroughly examined, and if the scale is found to be present and confined to a few trees, these trees should be taken out and destroyed, unless the infestation is slight, so that they can be gone over with a stiff brush and all these scales actually brushed off. In young orchards where the trees are not too large to handle it will pay to go over all the trees with a brush. Where the trees are too numerous or large they should be pruned back, removing as much wood as the tree can spare; the cuttings should be carted off and burned, and the tree should be washed with a potash solution. In California the insect is treated with gas which is formed by the action of diluted sulphuric acid on fused cyanide of potassium. This is not recommended for Eastern orchards, as the necessary outfit is too expensive, but wherever stock is infested in nurseries, or even suspected of infestation, all trees sent out should be made up in bundles with the roots wrapped to retain the moisture, covered with oiled canvas or other gas-tight material and fumigated for an hour, an ounce of cyanide to every one hundred and fifty cubic feet of space being used. This bulletin is worth careful study by all fruit growers, since the San Jose scale is one of the most dangerous insects introduced into the Eastern States within recent years, and no fruit grower ought to consider the matter so unimportant that he can afford to neglect it.—Garden and Forest.

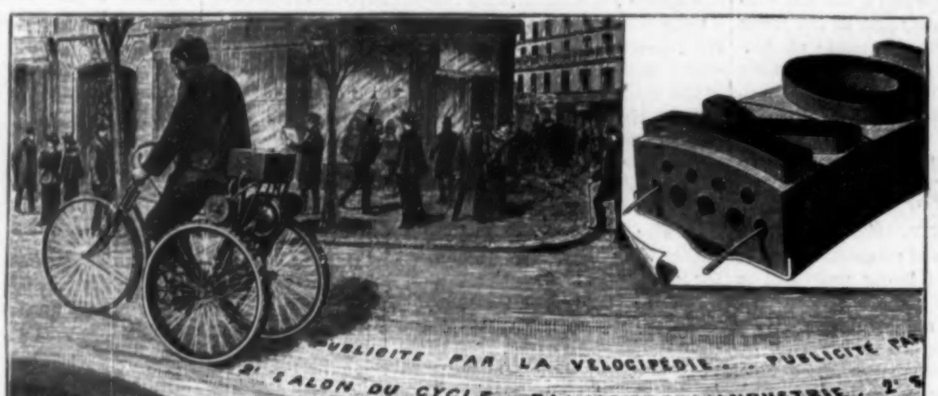
Snow Insects.

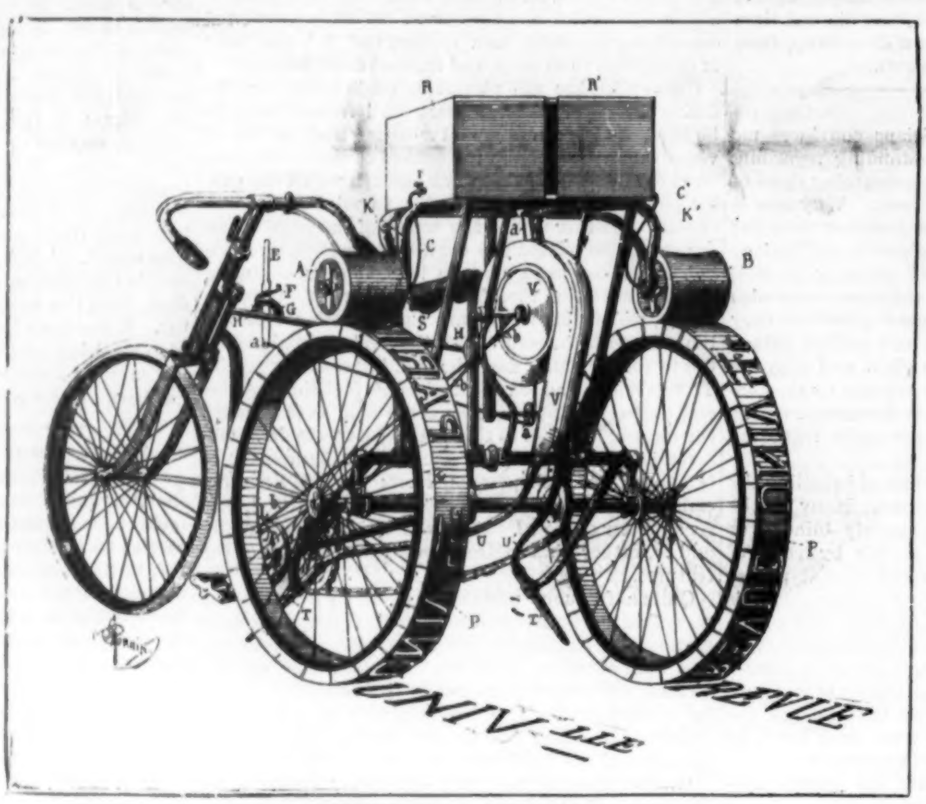
At Wurtsboro, N. Y., on January 10, after a fall of snow the surface was covered with small black insects. On microscopical examination they proved to be Thysanura, of the Poduradæ Burmeister family. They are found in gardens or hotbeds, on manure heaps and on the snow. There are many different species, and all have different habits. On the glaciers of the Alps the snow species is to be found. They take up their abode under stones, and hide beneath mushrooms and in damp, grassy spots. Often they leap together in the air, looking like a shower of sand. In the Wurtsboro case, they had probably come from some nearby stable or damp place.

Beet Leaves in Cattle Feeding.

We have on many previous occasions discussed the advantages and disadvantages of beet leaf utilization in cattle feeding. It has been pointed that there is danger in excessive feeding thereof, that colic, etc., were sure to follow, but that those pernicious effects might be overcome by certain precautionary measures. The principal element contained in beet leaves, and that most to be dreaded, is oxalic acid, which represents 10 per cent of the dry matter of beet leaves. But as the dry matter is 10 per cent of the beet leaves, it follows that when feeding 20 lb. leaves there is introduced 1·5 lb. oxalic acid. All organic salts are, as it were, harmless as compared with the action of an oxalate; and recent investigations in Germany point to the effort of the animal's bony frame to neutralize the poisonous effects of oxalic acid, by furnishing the requisite lime carbonate for a combination with the acid that would be a harmless oxalate, not assimilated during the physiological digestive process.

We have here an important hint as to the advantage of adding lime to beet leaves when fed to cattle. The question yet to be investigated is, whether it is better to add the lime to leaves before they are siloed, or during feeding. A fact not to be forgotten is, that the percentage of oxalic acid in beet leaves diminishes during their keeping. In this question of beet leaf utilization we have a series of problems to which our experiment stations should give their attention, and whatever conclusion is reached shall not be passed unnoticed in these pages.—The Sugar Beet.





ADVERTISING TRICYCLE.

Gratifying Results of the New Diphtheria Cure.

Consul General Mason, writing to the State Department from Frankfort, Germany, says:

In Paris, as has been stated on the authority of Dr. Roux, its use has reduced the diphtheritic death rate from 50 per cent of cases attacked to 14 per cent. The deaths from diphtheria in Paris during October, 1890, numbered 125; in the same month of 1892 they numbered 184, while in October, 1894, during which month antitoxine was extensively employed, the deaths from that disease numbered only 23. In Germany, diphtheria has been hitherto regarded as one of the most deadly and irresistible of diseases, the fatal cases ranging in some years as high as 60 per cent. Not less than fifty thousand lives have been annually sacrificed to this scourge in this country, and it is now believed, from the experience already gained, that this frightful tribute can be reduced to less than one-fourth of its present proportions when the use of antitoxine shall become general throughout the empire, and physicians in rural districts as well as those in cities are skilled in its application.

The discovery of antitoxine as a new agent for the prevention and cure of diphtheria was announced by Prof. Dr. Emil Behring, of Halle, about four years ago. Although received at first with more or less incredulity, the new remedy has borne successfully the test of actual use, and it is now recognized by high authorities as one of the most beneficent and interesting discoveries in modern pathology.

Horses are now exclusively employed to furnish the blood serum in which the antitoxine is developed and contained.

Dr. Behring found that when an animal which is by nature susceptible to diphtheria is inoculated repeatedly with gradually increased doses of diphtheria poison, or living bacilli, it becomes finally "immune" to (proof against) the poison of that disease, and there is developed in the tissues of the animal so treated an antitoxic principle which has the power to neutralize and render innocuous the poison which is secreted by the true diphtheria bacillus, as demonstrated in 1884 by Loeffler, which poisonous secretion, as is well known, forms the source of danger in diphtheria.

The neutralizing agent thus created was named "antitoxine," and is the specific which forms the basis of the new treatment of diphtheritic disease, both as a preventive and as a remedy in cases that have become actually developed. Precisely what this antitoxic agent is, has not been demonstrated. Chemistry has not separated and defined its constituent elements, but its action is perfectly understood, and is analogous to that of hydrated oxide of iron when used as an antidote for arsenical poisoning. In the presence of arsenic, the oxide unites with the poison and forms a combination which is not poisonous. In a similar manner, the antitoxine attacks and neutralizes the poison secreted by the bacillus of diphtheria, and this, so far as experience has shown, without immediate or subsequent injury to the tissues or prejudice to any of the functions of human life.

The finished antitoxine is a clear, amber-colored fluid, soluble in water, and is put up for use in strong, carefully closed, sealed and labeled vials, having a uniform capacity of 10 cubic centimeters, or one-third of a fluid ounce. The exact bulk of serum in each vial is regulated according to its number and strength.

Foreign Honors for an American Scientist.

A recent number of the Comptes Rendus announces the award of the Janssen prize of the French Academy of Sciences to Prof. George E. Hale, of Chicago. Prof. Hale, who is the director of the new Yerkes Observatory, has been especially interested in astrophysics and has followed out very successfully some suggestions made in 1869 by Prof. Janssen. He has thereby succeeded in photographing many of the details of the sun's disk, such as faculæ and protuberances, and has endeavored to catch the corona without an eclipse.

A MECHANICAL COLOR TEST.

BY MARCUS BENJAMIN, PH.D.

Early in 1894, the question of the possibility of analyzing various colors and shades in terms of certain standards having been referred to the present writer, he sought the advice of Professor Thomas C. Mendenhall and Professor John K. Rees, of the American Metrological Society, concerning the feasibility of appointing a committee to fix such standards. This action resulted in the naming of a committee, and, what has since proved of much importance, the taking up of the entire matter as a special investigation by the Physical Department of Columbia College, under the immediate supervision of Professor William Hallock and Mr. Reginald Gordon.

At the outset it must be stated that the important, the vital, element in any color system is the employment of proper standards. Physicists here and elsewhere have from time to time studied this subject and have determined standards, but it has remained for Professor Hallock to introduce practical standards that are easily procurable and readily determined. For this purpose he carefully sought out five typical colors from among the many pigments on sale in the open market. His selection was as follows: Best English vermilion, mineral orange, light chrome yellow, emerald green, and artificial ultramarine blue. Having chosen the fundamental standards, it became necessary to identify them exactly in the spectrum by means of the instrument known as a spectroscope and in terms of wave lengths of light.

As soon as the selection of the typical pigments was made, it became necessary to say exactly what they were in terms referable to the solar spectrum, and for this purpose the use of the spectroscope was essential. Prof. Hallock found his colors to have the following values expressed in microns: Red, 0·644; orange, 0·614; yellow, 0·585; green, 0·521; blue, 0·425. Thus the green 0·521 corresponds to the b line and the orange 0·585 is very close to the D line, which is the characteristic element in the spectrum of sodium.

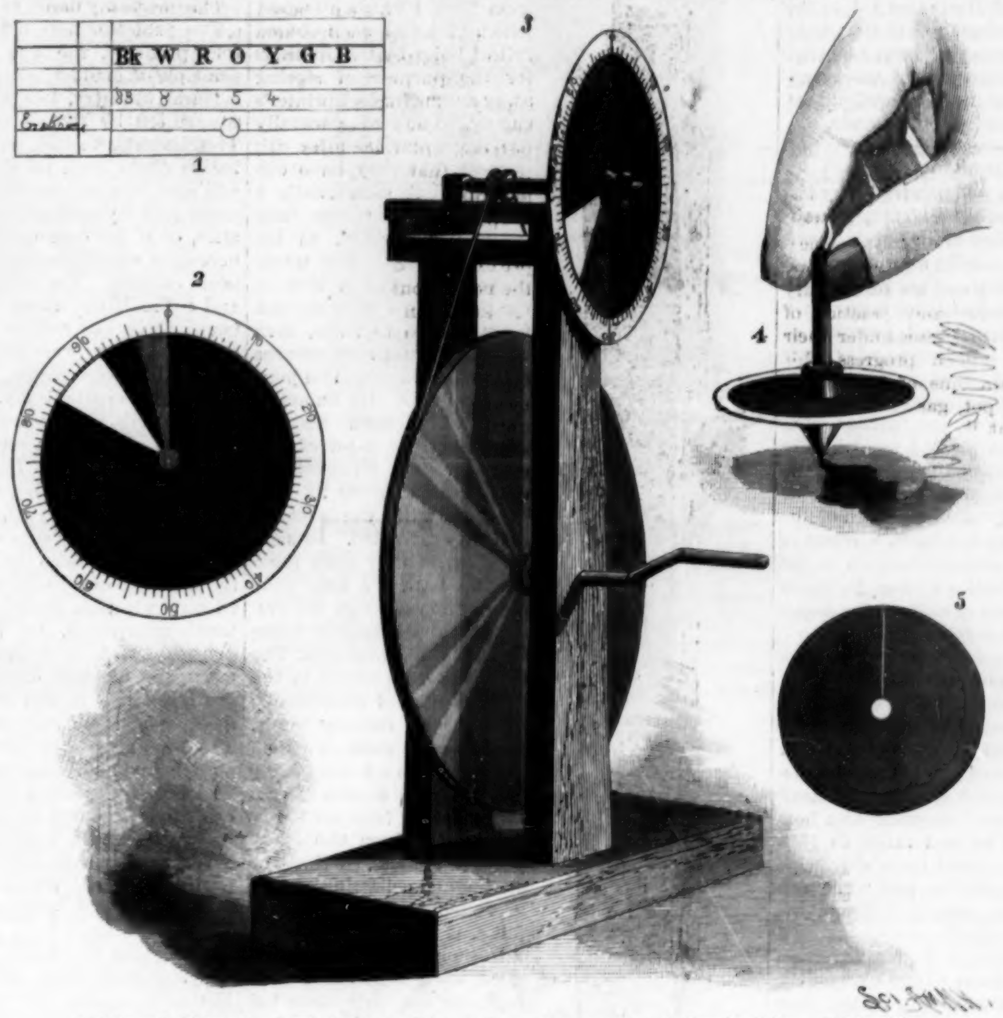
The important elements of luminosity and saturation require some consideration. We find that a color changes in value according to the degree of its illumination. That is under certain conditions of light the color is stronger or more intense than under certain other conditions. This effect may be artificially produced by the addition of black. So likewise color reflects to the eye a greater or less proportion of the white light that it contains. Hence by the use of black and white in addition to the standard colors selected, the further consideration of these elements may be eliminated.

With the five colors, and black and white, it is now possible to determine exactly in terms of the standards the composition of any shade or hue in existence. But how? This constitutes the second portion of the investigation. We have made our tools, and now to use them.

Sir Isaac Newton was the first to point out that white was decomposed into the so-called spectrum colors, and his name has also attached itself to an apparatus in circular form, on which are arranged disks of colored paper representing the spectrum colors. When this disk is rapidly rotated, the colors, so to speak, decompose themselves, forming a more or less white or gray. J. Clark Maxwell, an English physicist of recent date, perfected a similar instrument known as a color wheel. For the purpose of the investigation this instrument was used and seven disks were employed. They were about five inches in diameter, with a small hole at the center for the axis and a radial cut from the center to the periphery.

The white disk was of the purest white cardboard; the others were cut from light cardboard or heavy drawing paper, and painted each with its proper pigment, first mixed with a thick solution of gum Arabic in water to the consistency of oil paint, and then applied with a bristle brush. The color must be even and the paper completely covered. For the black disk a mixture of the best lamp black in an alcoholic solution of shellac was used and similarly applied with a bristle brush. A disk slightly larger than the foregoing, with a circular scale made by dividing it into exactly one hundred parts is also necessary. In use the colored disks are combined by overlapping each other until approximately the desired shade or tint is made, and then rapidly rotated until the different disks produce on the eye the effect of a single mass of color. The scale records the exact proportion of each used. Thus, for instance, the color known as cadmium orange is produced by using 65 parts of orange and 35 parts of yellow. Most colors, however, require the addition of either white or black. Hence we find the color fuchsia consists of 27 parts of red, 12 parts of blue, and 61 parts black. While, on the other hand, pearl blue consists of 22 parts green, 29 parts of blue, and 49 parts of white. Some shades require both black and white; thus mouse color consists of 5 parts blue, 14 parts white and 81 parts black. By means, therefore, of the wheel and standard disks it is possible to determine the composition of any color.

The investigation thus begun was to be developed into a system. It was decided to attempt the determination within reasonable limits of the composition of the many colors, shades and hues on the market.



1. Order card and formula. 2. Wheel and color disks. 3. The complete apparatus. 4. Experimental top. 5. Color disk.

A MECHANICAL COLOR TEST.

Thus, for instance, what is the composition of the once popular color known as crushed strawberry? For this purpose over 6,000 named samples of colored articles were collected from various sources all over the United States. These included about 3,500 silk threads, ribbons, plushes and other silk fabrics; 1,300 printed specimens of colored inks used in printing; 300 samples of colored woolens and cottons and some 400 paints, stains, pigments, etc. From these all the different specimens named "crushed strawberry" by their respective manufacturers or dealers were collected together and an analysis of each was made. From the results a formula for a color approximating to that which agreed to the average was deduced. To be specific, it consisted of 32 parts black, 24 parts red, 26 parts orange and 18 parts blue. Out of this collection of samples there has been prepared a table giving the exact composition of more than 500 colors, beginning with absinthe and ending with zulu.

In the actual manipulation Professor Hallock and Mr. Gordon were soon able to form an approximate idea of the composition of the color to be analyzed, so that the disks of its component colors could at least be immediately placed on the wheel, and then it was only necessary to adjust them in order to secure the result. The wheel was connected with a small dynamo, so that rapid rotation was made easy. In comparing colors, they held a sort of a mask in front of their eyes, so as to hide everything except the sample to be analyzed and the mass on the wheel. The results obtained by them are easily within practical limits, that is to say, if the proportions given by them are recomposed on the wheel, the result will match the sample so closely that the ordinary person cannot detect a difference.

This investigation is of the utmost practical value to the community. For the first time it fixes with exactness the composition of most known colors. For a long time the nomenclature has been very confusing. Amber, Havana brown, mazarine blue, and sea green give some suggestion of what they are like by their names, but such colors as Admiral, Charles X, luciole, and Pullman car, are not readily appreciable. If, however, the composition of Admiral is given as 13 parts of green, 37 parts of blue and 50 parts of black, we can see at a glance that the color is of a dark greenish blue. So likewise when the composition of Pullman car is said to be 86 parts of black, 4 of yellow, 5 of orange, and 5 of green, it is apparent that it is dark greenish yellow.

Turning to another phase of its utility, let us assume that we desire to match a piece of wall paper of the shade known as Pompeian red, of which we have a sample on hand. In order that the match shall be exact, we analyze the sample, and find it to consist of 89 parts black, 5 parts red, and 6 parts orange. Accordingly, our order should demand a paper that will agree with the foregoing composition. Besides wall papers, various fabrics can be easily duplicated by this process. Samples of cloth used in bookbinding can be matched with an exactness far beyond the usual commercial practice.

Other applications demonstrating the great practical value of this investigation will readily suggest themselves to the reader. The whole system is clearly represented in the accompanying engraving. In the apparatus shown the disk may be rotated by hand, and the same results are obtained as if it were rotated by an electric motor, as a variation in the rate of rotation does not produce a difference in the shade, but the colors blend in the same manner and degree irrespective of the speed. At the left is shown the graduated wheel and the superimposed colored disks. A voucher or order card is also given showing the manner of writing out the formula. The colored disk should be slit, so that the degree of color to be exposed to view may be varied according to the exigencies of the case.

An ordinary top may be used for purposes of experiment, and the various colored disks may be readily adjusted and clamped in position by means of a thumbscrew. Should such a system be brought into general use, it would result in the greatest advantage in the arts and would avoid the present confusion and uncertainty. Not only so, but with a constant and generally recognized standard, a color record could be preserved which would be of standard value for all countries and all ages, and colors could be read in the same value by succeeding generations as by those of the present day.

Our Lighthouses.

The lighthouses of the world number more than 7,000. The United States has over 1,300 houses and as many posts. The latter are simpler in construction and not very expensive, since they are maintained on shore. Our government has been proceeding with the theory that the coast should be so sprinkled with lights that the rays meet and pass; that a vessel will meet the one in advance before the one in the rear is out of sight. The annual appropriation for their keeping is now nearly $4,000,000.

Kerosene oil is that which has been adopted by the lighthouse board as the luminant, though gas and, to a limited extent, electricity have been given a trial. Gas is being used only at Alexandria, Va., and Newburyport, Mass. Kerosene is considered the best and the cheapest. It is ever reliable. Electricity will no doubt be adopted when Congress can be prevailed upon to appropriate money.

What is Electricity?

In view of the number of theories advanced in answer to this question, the question might perhaps appear somewhat superfluous when so many satisfactory solutions—all more or less different—are at hand. In his concluding lecture at the Royal Institution, however, Professor Fleming answered it once more as follows:

What (said Professor Fleming) is this mysterious agent which we call electricity, and which seems so ready to adapt itself to our needs? It was the first question people asked; it was the last to be answered. Our knowledge of electricity was comparable to our knowledge of biology, or any other of the sciences. We could see the life processes at work, but were no nearer understanding what life was. We could see electricity at work, but failed to perceive what the thing itself was. However, science was beginning to recognize one thing as the result of its researches, and that was that electricity was probably a wave disturbance of the ether analogous to the wave disturbances which we called light. With light we had waves of the imponderable, ethereal medium which filled all space (equally that filling up space between the stars as that between the smallest atoms of matter) vibrating at the astounding speed of forty-five millions of millions per second, with an amplitude of oscillation as minute as the 37,000th of an inch. The researches of Faraday, Clerk-Maxwell, and Hertz had led to the demonstration by actual experiment that electricity was also a wave motion of the ether of great rapidity, but with waves yards in length instead of mere fractions, like those of light. It was in this direction that the great discoveries of the future would be made.

The Pratt Institute Plumbing Class.

The benefit of trade schools is well illustrated by the observation of a correspondent of the Sanitary Plumber: A few evenings since I called at the Pratt Institute, Brooklyn, and was very kindly shown through the plumbing class departments. The instructors, Messrs. George Heath and John Todd, are thoroughly conversant with both the theory and practice of plumbing and ventilation, and the classes under their charge are making unusually good progress this season. As I glanced down the line of boys, each with his complement of tools, pot, gas furnace, etc., working away under the bright light, I could hardly suppress a wish that I was a boy again simply for the privilege of learning the trade under such favorable conditions. Memories flitted through my mind of the times when, with a few odd wiping tools, a scrap of pipe and a broken-eared pot, I relegated myself to the basement or wood shed to practice wiping joints, so that no one would see my failures or smile at the antics I went through when I burned myself.

As the instructor stooped to direct and encourage one of the students whose solder was dripping from the bottom of the joint he was trying to make, I reflected upon the cold indifference of some journeymen I was obliged to work with when an apprentice. They seemed to take no notice of a boy until he succeeded in making a passable joint, and then, instead of taking the cloth and ladle and showing him how to improve or indicate where he had failed in that particular style of joint, they would invariably wipe another kind, in some difficult position, and while putting the finishing touches on, remark, "When you can do that, you will be a plumber."

During one hour of the session of Wednesday evening of each week Mr. Todd lectures to the boys on the elementary principles of the trade. The entire class attends this lecture, but it is especially intended for the junior class, while on Friday evening the senior class alone listen to an explanation of the more complex questions, which their better knowledge of the business aids them in appreciating. Both lectures are illustrated by diagrams. After a student has become proficient in a certain branch of work he is allowed to finish an example of it and fasten it to the wall above his bench, as evidence of the progress he is making. This serves to stimulate the boys to greater effort, because none of them is satisfied to see their fellow students get ahead if it can be prevented.

A Collection of Brains.

Dr. Luys has offered to the Paris faculty of medicine, for the Dupuytren Museum, a collection of 220 brains, carefully prepared and catalogued by him during his long service at the Salpetriere and Charite Hospitals. In a letter to M. Brouardel, in which he calls his collection unparalleled in Europe, he describes in detail its scientific interest. "It presents," he says, "manifold samples of lesions of human brains, from the commonest ordinary hemiplegy, the aphasia, up to the most characteristic lesions of madness, and, as a foundation for the studies, hitherto so ill-based, of mental pathology, a series of types of persons suffering from hallucination or monomania, and of those who are chronically delirious with or without consciousness; and it presents also anatomical expressions in harmony with the symptoms observed. Types, of which there are four examples, relate to periodic madness. These are the first examples of the sort ever collected and offered to the examination of the medical public, and they show similar lesions which justly place them in a special nosologic category. Next come brains of general paralytics, with granulated lesions in certain regions and characteristic concomitant atrophy. I have collected also a number of brains relating to idiocy, some relating also to deafness and deaf-mutes. Others have been taken from persons blind of one eye, from the wholly blind, and from the amputated, and they all show special atrophic lesions. There are chosen specimens, to which I intend later on to add others (in particular the brain of a hypnotized subject, the only one at present in existence), and they allow us from the point of view of the morphology of human brains to gain a rapid and accurate idea of the rarity or the frequency of such anatomic dispositions, since it is thus possible to consult immediately from the point of view of verification the cerebral lobes which are present under the eyes." The collection is the result of twenty years' investigation, and Dr. Luys looks upon it as his scientific heritage, "a stone" in the edifice of neurologic studies, which are assuredly in our day a glory of French science.—Paris Correspondence London Times.

THE BORING WOODPECKER.

The drawing shows part of a cedar telegraph pole from near Phœnix, Oregon, which has been bored full of holes by woodpeckers for the purpose of storing away acorns for their winter's supply. The birds generally use large pine trees for this purpose, but they have discovered that occasionally a telegraph pole serves their purpose admirably, as the drawing shows. The woodpecker first digs a hole in the pole about large enough for an acorn to fit in, then he flies off and soon returns with an acorn which he jams into the hole. He hammers away at it with his bill until only the head of the acorn is visible. So tightly are these acorns driven in, that they are with the greatest difficulty extracted. In such numbers do they store them that the bark of a large pine forty or fifty feet high will present the appearance of being studded with brass nails. The birds also store acorns in the hollow stalks of dead plants, notably the century plant, the flowering stalk of which is often found completely filled with the acorns. Sometimes the oak trees are thirty miles away from the birds' place of storage, so that the storing and collecting of each acorn requires a flight of sixty miles.

TELEGRAPH POLE BORED BY THE WOODPECKER.

In times of famine all this good work shows to advantage, for not only birds but many kinds of beasts feed upon the acorns which the woodpeckers have so carefully hoarded. If it were not for the industry of the woodpeckers, they would have to die of starvation.

What People Will Eat a Century Hence.

According to Professor Berthelot, the distinguished French chemist, the time may be approaching when the farmer will go out of business, and bread and beef and milk, or their equivalents, will be produced artificially in the laboratory of the chemist. It is true that we have not yet got beyond the first steps in the process, but, according to Professor Berthelot, who is entitled to speak with authority, these first steps are a guarantee of extended triumphs in the same field.

The professor, as reported by Henry J. W. Dam, in McClure's Magazine, said that "new sources of mechanical energy would largely replace the present use of coal, and that a great proportion of our staple foods which we now obtain by natural growth would be manufactured direct, through the advance of synthetic chemistry, from their constituent elements, carbon, hydrogen oxygen, and nitrogen." He continued: "I not only believe this, but I am unable to doubt it. The tendency of our present progress is along an easily discerned line, and can lead to only one end. I do not say that we shall give you artificial beefsteaks at once, nor do I say that we shall ever give you the beefsteak as we now obtain and cook it. We shall give you the same identical food, however, chemically, digestively, and nutritively speaking. Its form will differ, because it will probably be a tablet. But it will be a tablet of any color and shape that is desired, and will, I think, entirely satisfy the epicurean senses of the future; for you must remember that the beefsteak of to-day is not the most perfect of pictures either in color or composition. There is a distinction which I would like to make at this point between the laboratory stage and the commercial stage of any given discovery in food making. From the scientific point of view, the laboratory result is the important one. As you and all the world know, the commercial result follows inevitably in time. Once science has declared that a desired end is attainable, the genius of invention fastens upon the problem, and the commercial production of the result slowly attains perfection by gradually improved processes at less and less cost. Take aluminum for instance. Once a very expensive metal, its steadily decreased cost in production is bringing it within the reach of all. The use of sugar is universal. Sugars have recently been made in the laboratory. Commerce has now taken up the question, and I see that an invention has recently been patented by which sugar is to be made upon a commercial scale from two gases, at something like one cent per pound. As to whether or not the gentlemen who own the process can do what the inventor claims, it is neither my province nor my desire to express an opinion."

The professor here cited as an instance of laboratory products, the dye stuff alizarin, the coloring principle of madder, which was formerly a great agricultural industry, but which is now almost wholly supplanted by the artificial product from coal tar. The chemists, he said, have succeeded also in making indigo direct from its elements, and artificial indigo will soon be a commercial product. "Tea and coffee could now be made artificially, if the necessity should arise, or if the commercial opportunity, through the necessary supplementary mechanical inventions, had been reached. The essential principle of both tea and coffee is the same. The difference of name between thein and caffein has arisen from the sources from which they were obtained. They are chemically identical in constitution, and their essence has often been made synthetically. The penultimate stage in the synthesis is theo-bromine, the essential principle of cocoa. Thus, you see, synthetic chemistry is getting ready to furnish from its laboratories the three great non-alcoholic beverages in general use. And what is true of food substances is equally applicable to all other organic substances."

As regards tobacco the professor said: "The essential principle of tobacco is nicotine. We have obtained pure nicotine, whose chemical constitution is perfectly understood, by treating salomin, a natural glucosid, with hydrogen. Synthetic chemistry has not made nicotine directly as yet, but it has very nearly reached it, and the laboratory manufacture of nicotine may be expected at any moment. . . . The tobacco leaf is simply so much dried vegetable matter in which nicotine is naturally stored. . . . Perhaps the greatest importance, and certainly the profoundest charm, in the study of synthetic chemistry is the certain evidence which it offers of the discovery and manufacture of many compounds now entirely unknown, whose effect upon human health, human life, and human happiness no one can possibly conjecture."

As regards the future supply of heat, which is no less important than that of food supply, Professor Berthelot speaks confidently of improved appliances enabling man to make use of the illimitable supply of the earth's central heat. In conclusion, the professor says: "If one chooses to base dreams, prophetic fancies, upon the facts of the present, one may dream of alterations in the present conditions of human life so great as to be beyond our contemporary conception. One can foresee the disappearance of the beasts from our fields, because horses will no longer be used for traction or cattle for food. The countless acres now given over to growing grain and producing vines will be agricultural antiquities, which will have passed out of the memory of men. The equal distribution of natural food materials will have done away with protectionism, with custom houses, with national frontiers kept wet with human blood. Men will have grown too wise for war, and war's necessity will have ceased to be. The air will be filled with aerial motors flying by forces borrowed from chemistry. Distances will diminish, and the distinction between fertile and nonfertile regions, from the causes named, will largely have passed away. It may even transpire that deserts now uninhabited may be made to blossom, and be sought after as great seats of population in preference to the alluvial plains and rich valleys."

THE present 1,500 foot tunnel and turbine wheel pit of the Niagara Falls Power Company will, when it shall work at its full capacity of 100,000 horse power, divert 3·64 per cent of the total volume of water and reduce the depth of the crest along the entire falls to the extent of 1¼ inches.

The Lion from a Medical Point of View.

The president of the Bristol Medico-chirurgical Society, A. J. Harrison, M.B., delivered before that society, on October 10, a very interesting address founded on his experience in the gardens of the Clifton Zoological Society, with which he has been connected for many years. It appears in full in the current number of the Bristol Medico-chirurgical Journal. The experiences and observations mentioned in the address are not arranged in any formal anatomical, physiological, or pathological order, as the author states, but, fragmentary and disjointed as they are, they are exceedingly interesting. The first case mentioned is that of a lion, considered to be the finest lion in Europe at the time, and one that had always seemed in excellent health until a few months before his death. One morning he was found dead in his cage, and at the post mortem examination it was ascertained that an enormous hemorrhage had taken place into the abdominal cavity, proceeding from the spleen, which organ, it was inferred, had been ruptured by the exertion of coitus. The splenic enlargement, says Dr. Harrison, seemed to have been caused by hyperæmia and increase in the lymphatic and vascular elements, but as to the ætiology, he can only speculate. "Are lions," he asks, "subject to malarious attacks? and had Hannibal been a victim in the days of his youth, in his native wilds—for he was forest bred—before the civilization of captivity had fallen upon him? He had been ill a couple of months or so before his death, when his breathing was affected. Did he have pneumonia then, with carnification of the base of the right lung—or perhaps more probably a hæmorrhage from an embolism—or are lions subject to splenic fever?

Another lion, a fine creature, had become lame by reason of an ingrowing claw. The trouble went on from bad to worse, until something had to be done, and it was decided to extract the claw. The use of chloroform, says Dr. Harrison, was out of the question, for attempts to give these animals anæsthetics have been worse than failures; so it was decided to resort to the "cramp cage." With some difficulty the animal was got into this cage. "He didn't like his quarters," the account goes on to say, "and showed that even within the comparatively small dimensions he could turn round and so evade any efforts to get hold of his claw. Planks of deal, one foot broad by one and a half inches thick, were then put into the cage to limit the space. The animal was fairly furious before; but now came such a display of rage that no one who did not see it could imagine it. He fought for dear life, as he thought. Plank after plank was seized and ripped up like so much match wood, and it seemed as if the iron bars and plates, strong as they were, would not contain the infuriated beast. His mouth bled, and he broke a tooth. Several of the keepers stood on the top of the cage to prevent it from being overturned, and some of the spectators took refuge by quietly withdrawing from the scene. At length, by putting in plank after plank, above and behind, the poor brute was brought to bay, and, to save himself from his very constrained position, pushed out his paws through the bars of the cage. 'Now's your time,' I said. Blunsden immediately seized the offending claw with a pair of strong carpenter's pincers; the grip was good. The animal helped in the operation by trying his best to get his paw free, and the claw came away. It had grown into the flesh at least half an inch, most likely more; and here I can show you the very thing. In half an hour afterward the creature had quite calmed down; he seemed then to have comprehended the rationale of the operation, and he gave me the conviction that if he had had to undergo a repetition, he would have been a mild consenting party. The operation was permanently successful."

The case of another lion is mentioned, one only four months and a half old, that was found dead in its cage. It had been ailing for three or four days; its breathing was very quick and it took no food, but simply lapped a little water. At the post mortem examination the pericardium was found distended with a semi-purulent fluid, of the consistence of gruel, tinged somewhat with blood. Notwithstanding the tradition that in old times, when lions used to be kept in the Tower of London, the lion named Pompey is said to have lived there for seventy years, Dr. Harrison says he cannot believe the story. He looks upon the lion, at least in captivity, as comparatively a short-lived animal, and gives various facts on which he founds this opinion. So decided is he that in the case of a lion that died at the age of sixteen years his conclusion was that the beast's death had been owing to senile decay. The death of a lioness, described as "rather rickety," is recorded as having taken place during parturition, from rupture of the right cornu of the uterus. The animal had been in labor for five days, and one cub had been born and the other was partly extruded into the vagina.

Dr. Harrison's address deals with pathological and physiological observations on various other animals, but the space at our disposal has allowed only of our referring to those of them that relate to lions.—N. Y. Med. Jour.

THE MYSTERIOUS CLEPSYDRA.

The destiny of old clockwork movements, when they are curious, is to figure in museums. Their rusty springs, broken-toothed wheels and out-of-center axes permit them to be no longer anything but the witnesses of a vanished art. This is an irresistible law. So it cannot be denied that a piece running in spite of this law three hundred and fifty years after its construction, without having undergone the least repair, is a remarkable object. Such is the case with a clock that is in operation at Mr. Pottin's, at Ivry-Port, and the age of which has been estimated by Mr. Morie Davy, the lamented superintendent of the Montsouris Observatory. Let us say at once that if it has escaped the sad fate of aged mechanisms, it is because it has no mechanism, since it is, in fact, a sort of clepsydra (Fig. 1).

Externally, we see merely a cylinder about six inches

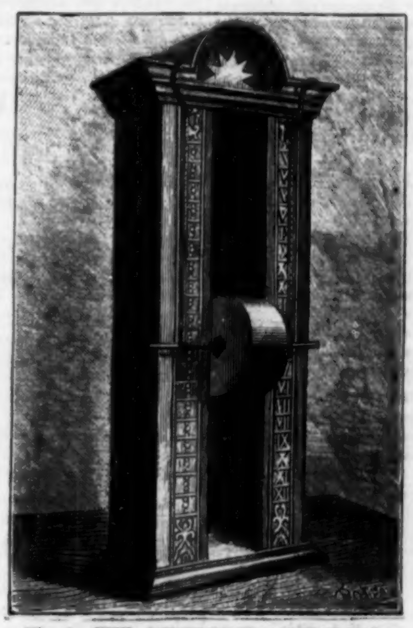


Fig. 1.—THE MYSTERIOUS CLEPSYDRA.

in diameter, suspended by two strings winding round the extremities of a small rod that passes through its axis. If, after having finished the winding of the strings by revolving the cylinder upward, we leave the apparatus to itself, the cylinder, after oscillating for a couple of seconds to find its perpendicular, will begin slowly to descend, and take eighteen hours to travel, with precision, the entire length of the scales to the right and left, whose divisions are of copper set into the walnut of the case. This curious result is obtained as follows: The cylinder (see diagram, Fig. 2) is di-

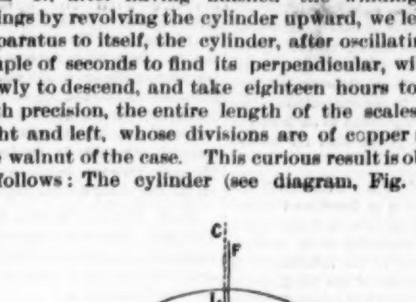


Fig. 2.—EXPLANATORY DIAGRAM.

vided into eight compartments, which are exactly equal and symmetrical with respect to the axis, O. These compartments, G, G_1, etc., communicate with each other through three small apertures, I, I_1, etc. Central channels, R, put them in connection also in pairs. Thus G_7 communicates with G_3, G with G_4, G_1 with G_5, and G_2 with G_6. The cylinder is filled with liquid up to the level, M N. Let us suppose it suspended by the string, F, wound around O, to the right of the vertical, which passes through the center of gravity of the system, C D; evidently, gravity will cause the apparatus to revolve in the direction shown by the arrow, V. But in this motion there is produced a change of level of the liquid to the left and right of C D, in the system of communicating vessels formed by the compartments, G, and the small apertures, I. The liquid rises to the right and descends to the left until the center of gravity passes through the vertical including F. The descent of the cylinder then ceases, and is again resumed in measure as the two levels tend to become equal by the slow communication through the orifices, I. As such equalization can take place only so long as the cylinder is suspended, the slow motion of descent continues indefinitely. It takes place in a perfectly regular way, because all the parts of the cylinder are symmetrical with respect to the central axis. An examination of Fig. 2 will readily show that it is possible for the compartments to communicate during the descent only through the small apertures, I. It will be seen also that the winding up of the apparatus is exceedingly simple. It suffices to revolve the cylinder in the direction shown by the arrow, V'. The string winds around the central axis, and, in measure as the apparatus ascends, the compartments become emptied, through the central channels, R, into their mates, whence it results that, no matter what the height be, the system left to itself will find its perfect equilibrium at the end of two or three oscillations.

Mr. Morie Davy attributes the construction of this clepsydra to an artist of the time of Henry II. It is probable that workmen of less skill have attempted imitations of it, since in the region of Brie, where Mr. Pottin obtained it, at least twenty more have been found, but all incapable of operating. At the Exposition of Retrospective Arts, in 1889, there was to be seen a copper cylinder having much analogy with the one just described and bearing the inscription: Clepsydra of the Time of Charlemagne." Were not a few centuries too many given to this product of ancient art? We cannot say. We have simply desired to make known a very simple and very accurate instrument which certainly very few clockmakers even know of. From this standpoint it merits particular mention.—La Nature.

The Invention of the Bicycle.

A monument has been recently erected at Bar-le Duc to the two Michaux, father and son, who are credited with the invention of the modern bicycle. The Petit Lyonnais tells the story of the invention as follows:

"The Michaux had a small locksmith shop in Paris. One day a bizarre machine was given to them to repair—a small saddle resting upon a snake-like frame and holding together two light wheels. The machine was put in motion by the 'rider' striking the ground with the tips of his toes. The queer thing was painted yellow, and called a draisine, from its inventor, the German forester, K. V. Drais. A 'ride' on this was very tiring, impossible uphill, and, above all, very ungraceful. But the young bloods in the time of the Second Empire managed very well with it, and got lots of fun out of the machine. Young Ernest Michaux conceived the idea of adding pedals to the front wheel, and became thus the inventor of the modern velocipede. His idea found little favor at first; more attention was given to the tricycle. As early as 1863 a Paris hatter named Brunnel visited his customers on a tricycle.

"The International Exhibition of 1867, however, gave an impulse to bicycle riding by drawing the attention of the public to several new improvements added by the Michaux. The Prince Imperial learned to ride, and the aristocracy, with the Prince of Sagan at their head, followed his example. The latter had two high-wheeled machines built to order. One was of aluminum bronze, with wheels of rosewood; the other was built entirely of steel, beautifully engraved with hunting scenes. The bicycle school of the Michaux was now always full. They could no longer fill all orders, and formed a company for the manufacture of their machines. They also built a velodrome, with an asphalted track, on which also a kind of hurdle race could be run. Here was a ditch, which had to be crossed on a narrow plank, and a kind of Irish bank. Lawsuits among the partners broke up the concern, the war of 1870 came, and people had other things to speak about. In the meantime the English and Americans improved the invention, and it was reintroduced into France from across the sea."—Public Opinion.

A Novel Logging Device.

There is a wood pile in Lead City, S. D., widely known throughout the Black Hills mining region. It belongs to the Homestake Gold Mining Company, and is composed of timbers about the size of railroad ties, which are used in supporting the walls and roofs of the drifts and tunnels of the mines. A narrow gauge railroad brings the logs, which have been sawed flat on two sides, to a point on the mountain slope about 600 feet above the valley, and they are then thrown into a wooden chute about 4 feet wide and 3 feet deep. The inside surface is kept smooth and slippery by a small stream of water. If the logs were allowed to run directly to the ground, they would speedily excavate an enormous hole besides damaging themselves, so the lower end of the chute is curved upward, and the logs leave it at an angle of about 60 degrees with the horizontal and rise from 150 to 200 feet in the air, turning over and over, and finally landing on the enormous pile already there. A useful fact in connection with this method is that the logs sort themselves in the pile according to their size: the heavier ones, having a greater momentum, are all found at the side farthest away from the chute.

RECENTLY PATENTED INVENTIONS.

Engineering.

BOILER FEEDER.—Moses Gregson, Philomath, Oregon. To feed at regular intervals a measured quantity of water to a boiler, this inventor has devised an apparatus comprising incased rotary valves having crank arms, the upper valve having a two-way passage and a steam pipe extending from the lower end of the casing below the lower valve and communicating with the upper part of the casing through the two-way valve, while an oppositely cranked shaft and pitmen connect the cranks with the valve cranks to alternately open and close the valves. Water of any temperature may be used with this device without interfering with its working

Railway Appliances.

CAR BRAKE.—Robert C. Snowden, McKeesport, Pa. This improvement is more especially applicable to street cars. The brake shoe is first applied to the wheels by means of a hand wheel, and the friction of this brake shoe and the momentum of the car applies a brake shoe to the track rails. A set of toggle arms is arranged immediately above and connected to the rail brake, there being also connected thrust bars, and both being operated simultaneously to apply the brake to the rails by both a vertical and lateral thrust.

CAR FENDER.—John H. Faulstich, New York City. This fender has a vertical fixed section adapted to be supported in front of the dashboard, and a lower horizontal sliding section adapted to pass beneath the car, this section yielding sufficiently to break the force of the fall upon it of any one in the track of a moving car. The sliding frame may be quickly carried from the inner to the outer working position, and in conjunction with the fender a guard is provided for the wheels at the sides of the car.

POULTRY CAR.—Joseph B. Mockridge, New York City. This is a completely ventilated car for the shipping of live poultry to great distances, providing for the convenient feeding, watering, and continued cleanliness of the birds. An open framework with a compartment for each bird forms a permanent fixture of the car, and is arranged in an inclined position, with the single compartments in vertical rows, so that the droppings are discharged through an opening in the floor of the car. The side doors of the car are so arranged that the attendants can move one door past the other, to load the car in sections until the entire car is loaded.

Mechanical.

CLIP FOR BRAKE STAFFS, SHAFTS, ETC.—Albert W. McCaslin, Pittsburg, Pa. This improvement consists of a bolt, preferably in the form of a carriage bolt, on which is held a clip band engaging part of the brake staff or shaft, to form a brace for the bolt, the device being applicable for fastening a chain to a car brake staff, or to a roller bar, a winding bar, or on shafting, and taking the place of eye bolts. It is simple, easily applied, and not liable to break on a heavy or sudden strain.

PAPER COATING AND DRYING MACHINE.—Louis Dejonge, Jr., Stapleton, N. Y. In this machine sheets of paper or similar material are automatically clamped to a carrier, conveyed to a color-applying mechanism and held from buckling while being coated, automatically released at a given point and elevated for removal. The wet sheets may also be automatically removed from the coloring or coating section and made to travel through any desired number of runs, hanging in a pendent position, until the drying operation is completed. The carriages or conveyers for the sheets are arranged close together without interfering with each other, the carriages being automatically returned to the coloring section of the machine when the sheets are removed, and the dip does not injure the sheets in gripping them, the coating and the drying being effected without marring the uncoated surface, if the coating is on one side only.

DRYING COATED PAPER.—This is a further invention of the same inventor, improving upon the drying section of the other machine, tapes being employed to maintain the coated paper for a certain time in the drier in a substantially horizontal position, whereby heavily coated thin paper will not buckle or turn at the corners. An improvement is also effected in the manner in which the sheets are carried from the receiving point in the machine to the discharging point.

LATH AND CHAIN PAPER DRIER.—William H. Greenwood, New Brunswick, N. J. This invention provides an auxiliary lath box adapted to feed a lath on the chains of a lathing or sticking machine when the main lath box fails to deliver a lath, or when a broken lath may have been delivered, whereby the paper will always be taken up at the proper time to form folds for drying, without danger of spoiling the paper.

Agricultural.

COMBINED PLANTER, HARVESTER, HAY RAKE, AND CULTIVATOR.—Joseph Ehrhard, Diller, Neb. With this machine stalks may be cut and the ground plowed and cultivated, corn may be drilled and cultivated, and all kinds of small seed planted, the machine being also utilized for harvesting grass or grain of any description. It has vertical standards which may be utilized to carry plow blades, cultivator blades, harrow teeth, or similar implements, and each standard has loosely mounted upon it an arm carrying a covering wheel traveling over the path of each disk cutter at the rear. There is a driving connection between the seed-dropping mechanism and one of the axles, and between the axle and the sickle, the devices when not in use being carried out of action. The rake may be used in connection with the sickle or each employed independently, or both may be removed or elevated when the machine is used for cultivating or planting.

TRANSPLANTER.—Henry P. Meetze, Chapin, S. C. This device consists of a funnel-shaped body constructed in pivoted sections adapted to open at their lower ends, packing arms operating at each side of the body opposite the division, and there being a connection between the packing arms and the handles of the body. Plants may be conveniently placed in the device, and the latter may be readily introduced into the ground in the desired position, the earth being packed sufficiently around the plants without interfering with the withdrawal of the device.

Miscellaneous.

VARIABLE DRIVING GEAR FOR BICYCLES.—George B. and Amy F. Robinson, Colorado Springs, Col. This improvement dispenses with the use of sprocket wheel and chain, and the gear permits of being readily changed to yield three different rates of speed, high, medium, and low, the shifting parts being arranged in a simple and easily working way. The driving shaft, geared to the rear wheel, is provided with a slidable cone gear adapted to engage a gear wheel slidable on the pedal shaft, the shipping mechanism for sliding both gears being actuated through a lever extending up within convenient reach of the rider.

PNEUMATIC TIRE.—John J. Koetzner, Washington, D. C. In this tire an annular under-cut groove is formed on the outer periphery of the rubber tube, and in this groove is packed a filling of emery or other good resistant, over which is cemented a covering of rubber, leather, or similar material, the outer surface being finished to the proper external circular form of the tire. The improvement is designed to protect the tube containing compressed air from being punctured by tacks, sharp stones, etc.

CIRCLE CYCLE.—Edward I. Brannan, Richmond, Va. This is an improvement in merry-go-rounds, and provides an apparatus by which riders may simulate ordinary bicycle riding without danger of accidents. The apparatus is formed of detachably connected sections which may be readily taken apart for storage or transportation, and comprises a turn post and circular trackway having a yielding bearing face, with radiating supporting sections, the supporting wheels having a yielding bearing on frames whereby they are normally held from contact with the track ways.

PYROTECHNIC SIGNALING.—Nicholas J. Halpine, United States Navy. For long distance signaling at night between vessels at sea this inventor has devised a system which consists in projecting above the sender a single star, which, by its successive changes of color, will represent a numeral or letter, the system being thus adapted for use in connection with the ordinary international and military codes. The changes in the coloring of each star take the place of the numerous stars heretofore required to represent a single letter or number.

MANUFACTURING ARTIFICIAL BONE.—Robert Reiman, Egg Harbor City, N. J. This is an improvement on a former patented invention of the same inventor for a process of making white artificial bone, the process covered by this invention relating more especially to making black artificial bone, but the two processes, though differing in some respects, being actually a unit. The process embraces the macerating of the natural bone, separating the liquid from the organic solids, separating the gelatine from the residue of the organic matter, and then converting the gelatine into artificial bone without the residue by adding a chromate, a drying oil and a material to give body to the composition. The product is uninflammable, is impervious to the influence of weather and forms a perfect plastic mass for numerous industrial purposes.

DRAWING INSTRUMENT.—Herrman A. Kleist, Philadelphia, Pa. This is an instrument of the compass type, dispensing with set screws, while the slip joint is arranged without the fastening device forming an obstruction on the outer face of the instrument. It has a pivot point in which the wear of the pivot pin is automatically taken up, and it has a bail handle by which the legs may be held in any position in which they may have been placed, preventing their wabbling in making a circle or an arc, and enabling the instrument to be handled with precision.

PARALLEL RULER.—Augustus S. Cooper, Santa Barbara, Cal. In this ruler a head is fitted to slide on a straight edge, while a drawing blade has a head fitted to slide in one open side of the sliding head and abuts against one edge of the straight edge, obliquely arranged springs connecting the sliding head with the drawing blade, and there being a set screw in the head for regulating the distance apart the lines are to be drawn. The springs consist preferably of rubber bands extending over both sides of the straight edge and passing through apertures in the head portion of the drawing blade and the connecting arm of the sliding head, all of the parts being thus held together.

INDEXING CUTTER.—John T. Carmody, Cedar Rapids, Ia. This is a simple hand tool for cutting semicircular nicks in the edges of indexed books to facilitate reference to the required letter. It is a powerful tool, designed to cut through many thicknesses of tough paper with a clean, sharp cut. It has jointed lever handles, with curved registering blades set between and fixed to the inner faces of the jaws, one blade working within the other and the tool effecting a double shear cut starting simultaneously at the two ends and terminating in the center.

RECORDING DEVICE.—Adrian C. Kintner, Bedford, Pa. For recording the variations of a timepiece to facilitate setting and regulating it, this inventor provides a device comprising a dial with an opening and two fixed segmental graduations at opposite sides, pivoted pointers indicating on the graduations, while a ring turning on the pointer pivot has indications adapted to appear in the opening of the dial.

PURSE FRAME.—Louis B. Prahar, Brooklyn, N. Y. The jaws of this frame are pivotally connected and spring controlled, and have a sliding movement in opposite directions on their pivots, such sliding movement being effected by pressing upon studs which pass loosely through the outer ends of the jaws, and thus releasing the jaws from a latch or lock engagement with each other. The jaws or members of the frame lock automatically on being closed.

WORKING BUTTON HOLES.—Cornelius Donovan, San Francisco, Cal. To facilitate the making of hand-worked button holes this inventor provides a simple device to clamp the cloth near the button hole and to guide the needle in stitching. The device comprises two hinged plates with pointed noses and opposite curved recesses, one nose having beveled edges and the other a grooved flange, there being means for clamping the plates together.

ORNAMENTAL SHEET METAL HOLLOW WARE.—Albert Wanner, Jr., Hoboken, N. J. This inventor furnishes the constructive detail, which may be considerably varied, for an inexpensive and highly ornamental article, such as a vase for flowers, receptacles for jewelry and toilet materials, articles for cabinet adornment, etc. The metallic structure, coated with gold, silver or bronze dips, presents a rich and chaste appearance.

BOOT OR SHOE JACK.—John I. E. Nelson, Cedar Home, Washington. This is a light and easily adjusted device, efficient for both right and left shoes and useful in studding the soles of boots for logging, mining and mountain climbing, while specially adapted for repairing and reinforcing the bottoms of rubber boots. The main stock section has a socket in which fits a tenon of the instep section, while the last has an opposite tread section reversible upon the instep section, a lock device securing the last upon the instep portion.

OAR.—Charlie O. Hodges and George H. Gardner, Batavia, N. Y. An oar which may be used with the oarsman facing the bow has been devised by these inventors, the oar being one which may be feathered or moved in any direction as an ordinary oar. The oar has a body section and a body and blade section, and tubular arms pivotally connected with a rocking frame attached to the gunwale of the boat, rods attached to the two sections of the oar passing loosely through the tubular arms, while a connecting block unites the opposing ends of the rods. The improvement may be quickly and easily applied to a boat.

ROPE CLAMP.—Henry Vachon, Golden, Canada. This invention comprises a two-limbed clamping plate adapted to be pivoted on a transversely slotted pulley block opposite the transverse slot, forming an efficient attachment for quickly securing a rope's end to a shackled pulley block, a stationary rope cleat or a rotatable snubbing post, to facilitate mooring a vessel or holding in place any movable structure.

HOSE COUPLING.—William L. Walker and William A. Nelson, Fitchburg, Mass. The head of one hose section, according to this improvement, has a beveled opening in which is a gasket and a hook-shaped clasp opposite which are parallel ears, there being between the ears a spring latch and a pivoted cam lever, while the head of the opposing hose section is provided with an annular flange to be engaged by the cam lever and received by the hooked clasp. The action of the cam lever makes the connection tight and holds the sections securely in water tight engagement, a disengagement being effected by a moderate lateral pull on the lever.

CUTTER GUIDE FOR BARBERS.—James H. Howard and Woodford A. Scoggan, Oregon City, Oregon. To facilitate the even cutting of the hair with the ordinary clippers or any other suitable cutter, these inventors have devised a guide comprising an open frame having a downward extension or bearing at its forward end, while a comb plate within the frame has its back mounted adjustably in bearings above the extension. The comb plate may be adjusted to guide the cutter to cut the hair at any desired length.

BED PAN.—Moses S. Diamond, New York City. This is an improved article of manufacture designed to be lighter and less expensive than such articles heretofore, and so made that it may be easily and conveniently cleaned.

Designs.

JUG.—Frederick H. Weeks, Akron, O. This jug is closed at the ordinary opening at the top, and has at one side a spout with a protuberance on the opposite side, there being ears at right angles to the spout.

BRACKET.—Edward S. Field, Metchosin, Canada. This is a simple bracket adapted to hold brooms, and has two projecting arms curved toward each other, the opening between the arms flaring outward at the top.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

MODEL ENGINE CONSTRUCTION, WITH PRACTICAL INSTRUCTIONS TO ARTIFICERS AND AMATEURS. By J. Alexander. London and New York: Whittaker & Company. 1894. Pp. viii, 324. Price $3.

The author, in his preface, speaks of model engine making being a hobby. He makes for it, however, the plea that it is of invaluable use to young mechanical engineers and advocates that all such devote themselves to it. In addition to its over three hundred pages of text, the book contains a very exhaustive series of large scale drawings to illustrate the subject and make it practical. It cannot but be believed that a young man can spend his time more profitably in building model engines than in many other occupations, provided, of course, that his future work is to lie in practical or scientific lines.

LABORATORY EXERCISES IN BOTANY, DESIGNED FOR THE USE OF COLLEGES AND OTHER SCHOOLS IN WHICH BOTANY IS TAUGHT BY LABORATORY METHODS. By Edson S. Bastin. Illustrated with 7 figures in the text and 87 full page plates from original drawings, comprising upward of 250 figures. Philadelphia: W. B. Saunders. 1895. Pp. 540. Price $2.50.

Modern botanical work, in this octavo, seems to be adequately treated; with numerous illustrations, very full text and an index of nearly 20 pages, everything seems to be present which could be desired for the school. It cannot be reviewed within the space at our disposal, but what we have seen of it is enough to make us recommend it to our botanical readers. It is divided into nearly 60 different exercises, each exercise forming practically a chapter and being fully described in the table of contents, when such description is required. We notice, moreover, a very full treatise on the microscope and accessory apparatus, special reagents, staining fluids and mounting media.

PERENNIAL IRRIGATION AND FLOOD PROTECTION FOR EGYPT. Plans. Ministry of Public Works, Government of Egypt. 1894. Elephant folio, 29 plates.

Although no text accompanies the set of plans it will be readily seen by an examination of them that the engineering works contemplated by the government are of great importance and are of the first magnitude. The plans of the Nile on a scale of one to one hundred thousand are admirably executed. The other plans include designs for various dams, sluices, weirs, gates, inlet and outlet canals, discharge sites, etc., as well as plans of the Assuan cataract, pressure and discharge diagrams. The question of flood protection and irrigation in Egypt has occupied the attention of engineers from the earliest times, and it is to be hoped that the problem will at last be solved successfully.

Business and Personal.

The charge for insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(6402) **W. C. McC. writes: 1. I am about** to wind an induction coil for a medical battery. In what way would you wind the wire, so that it will give three currents—primary, secondary, and primary and secondary combined? I am going to have three binding screws; how will the connections be made? Also which way would you advise to regulate the current? With a tube sliding over the core or over the whole coil? How does the tube in either way affect the current as to weakening and strengthening it? A. For medical induction coil we refer you to our SUPPLEMENT, No. 569. For primary connections connect wires from handles to each side of the make and break contact mechanism. For combined place primary and secondary in series. Arrange regulating tube as shown in SUPPLEMENT above referred to. When tube is pushed in so as to cover the core, it weakens the effect of the coil. 2. How many volts are there in two Mesco dry batteries? A. Allow 3 volts.

(6403) **S. M. M. asks: Will you please** let me know by letter what the resistance of ordinary fresh water is, hot and cold, and through what resistance will an ordinary gravity battery, say a bluestone, ring a vibrating bell. A. Water is of almost infinite resistance, except when the potential is high enough to electrolyze it, and then it needs some salt, acid or other compound to give it electrolytic conduction. A single gravity battery will not electrolyze it, and hence cannot maintain a current through it. By using large iron electrodes in the caustic soda solution, two or three cells would ring a bell.

(6404) **O. J. asks: 1. Which is the best** for the core of an induction coil—a solid core or one built up of wires? A. A wire core. 2. Which is the best way to have the brass tube regulator of an induction coil—between the primary and secondary coil or between core and primary coil? A. It matters very little; place as most convenient. 3. Should there be any special ratio between the amount of wire on primary and secondary coil? A. No. 4. Which is the best solution for a bichromate of potash battery—solution of bichromate of potash or of chromic acid? A. Chromic acid or sodium bichromate. 5. I can only get chemically pure chromic acid here at 60 cents an ounce. Could I use that in a battery, and if so, will you please give me a formula? A. Use the bichromate. 6. In calculating the length of wire in a certain weight of wire, about how much or what per cent should I deduct for weight of insulation? A. It depends on the kind of insulation. For cotton-covered wires it is very trifling.

(6405) **H. E. asks: 1. Can electricity be** created or formed in a closed box or vessel in which there is a pressure of three or four atmospheres of air, as well as in open or one atmosphere of air? A. Yes. 2. What propelling power or part of horse power has a wind of 15 miles rapidity per hour on a sail of twenty-five square feet? A. The pressure of wind at 15 miles per hour is 1·125 pounds per square foot on a stationary plane or sail, and on 25 square feet would be 28 pounds. If the sail should be moving before the wind, the pressure would be somewhat less, or equal to the loss due to the progress of the sail. So that if the sail were moving at the rate of 5 miles per hour, the pressure would be 1 pound per square foot, or 25 pounds for the sail as above stated. The speed per minute in feet multiplied by the pressure will equal foot pounds of power, 440 feet×25=

$$\frac{11{,}000}{33{,}000} = \tfrac{1}{3} \text{ of a horse power.}$$

(6406) **R. K. B. writes: I have in my** office an electric bell communicating by wire and knob with my private room. The bell has been in operation for six months, and for the first four months worked properly. For the past two months I have been unable to make the bell work by pushing the button (after it has remained unused for a few hours) without five or six successive pushes. I have had a new knob attached and an extra battery, but this does not help the matter. A. Clean your binding posts and connections and the contact points of the bell.

(6407) **T. R. says: In a cylinder** boiler 36 inches in diameter lying horizontal, filled with water, it was found necessary to take out one-fourth the water. What would be the perpendicular distance from top of boiler to the level of the water? Take an equilateral triangle and suspend weights of 5, 10, and 15 pounds respectively on each point. How to find the central point on center of gravity in this triangle. Please give formulas for the above questions, avoiding algebra, if possible. Please give your opinion of cylinder boilers, 30 feet long and 45 feet long, 34 inches diameter, both working under similar conditions in every respect, which will produce the most steam in a given time and which is the more economical? A. The distance from water to top of boiler will be 10·72 inches. Rule—Divide area of circle by the square of its diameter, and with the quotient find in the table of "areas of segments of a circle," in Haswell's "Engineer's Pocket Book," the proportional versed sine of the diameter, and with this multiply the diameter for the required distance. As in your case area 36 inches $= \frac{1017{\cdot}87}{4}$ square inch = area of segment = 254·49 square inches and $\frac{254{\cdot}49}{36\times36} = 0{\cdot}1963$, and opposite 0·1963 in the segment table will be found 0·298×36=10·72 in the answer. For the center of gravity of an equilateral triangle, bisect each side inversely in the ratio of the weights respectively and draw a line from each angle to its opposite point of bisection; the point of crossing of these lines will be the center of gravity of the triangle as loaded; the triangle itself not considered. The boiler having the largest fire surface will produce the most steam with equal amounts of fuel, and is the most economical.

(6408) **R. L. E. writes: I would like to** submit the following. With water pressure 100 pounds to the square inch, how large a nozzle must I have to drive a Pelton water wheel directly attached to a 200 light dynamo? Also which is the best type of incandescent dynamo, 110 volts, for such a purpose? Also how large a diameter of Pelton wheel to get the right number of revolutions? A. You will require about 22 horse power for 210 12-candle power lamps. At 100 pounds pressure, a 1¼ inch nozzle on a 24 inch Pelton wheel will give the required power at 580 revolutions per minute, using 56 cubic feet of water per minute. As the dynamo must run at a speed of 1,200 to 1,400 per minute, pulleys and belt must be used to bring up the speed. For a direct connected dynamo a pair of 12 inch wheels may be used with 2⅞ inch nozzles, using the same amount of water with a speed of 1,160 revolutions per minute. A four-phase dynamo requires less speed than the two-phase, and is the best form of dynamo for economy in the application of power.

(6409) **H. K. asks: 1. What size wire** shall I require to make a helix like the one illustrated in "Experimental Science," on page 577, Fig. 6, if the dynamo on page 488 is employed to work it? A. The helix will answer for the dynamo in question. 2. When a permanent steel magnet loses its magnetism, is it necessary to retemper it before remagnetizing it? A. No. 3. In what manner are teeth painlessly extracted by means of electricity? Is the operation really painless? A. The induction coil discharge has been applied to deaden or conceal the pain. 4. Please give scientific explanation why it is that the brass tube which slides over the iron core of a medical induction coil affects the primary and secondary currents? A. The brass tube has developed it in local currents, thus absorbing lines of force which otherwise would go to excite the secondary. 5. Can you give me a receipt of a depilatory which when once or twice applied would permanently destroy the roots of the hair, and thus do away with shaving? A. No. 6. In experimenting with a Jablochkoff candle (on an arc circuit of 2,500 volts, 10 amperes and carbons separated by plaster of Paris one-sixteenth inch) I noticed that when the current was turned off after the lamp had burned about 20 minutes that the points of the carbons emitted a peculiar odor. Something like the unconsumed gases that sometimes issue from a locomotive (using hard coal) when it is fired up with fresh coal. What is the odor due to, and do all forms of arc lamps give the same peculiar smell? A. It is hard to say just what the odor is due to. Possibly it was ozone, which is liable to be produced in all electric discharges. Your other query cannot well be answered from the data given.

(6410) **C. M. A. writes: Some few days** ago one of the rubbers in one of the ball gauge try cocks on Erie City boiler water column blew out, causing a small jet of steam to escape from it, and while replacing with new rubber I received rather a heavy shock, and upon investigation found that one of our boilers seemed to be charged with electricity. Holding a knife or any metallic tool near it caused a bright spark at point of contact. During such times I was standing on a ladder placed upon a dry floor. Is there any reason or cause to believe that the electricity was generated by the friction of the escaping steam? If so, why can it not be found in any boiler at any time under steam pressure, and never occurring before nor since? A. Very powerful electric excitation is produced by escaping steam. A number of conditions are essential. Sometimes quite severe shocks have been received from boilers. Undoubtedly the setting of your boiler contributes to the result in effecting a more or less complete insulation from the earth.

(6411) **W. W. F. writes: 1. What effect** has tension on the molecular vibrations in metal? If a hot wire were made to sustain a heavy weight, would this shorten the swing of its atoms or lessen their rapidity, or, in other words, would the tension cause the metal to cool and contract more rapidly than it otherwise would? A. Simple tension has no effect as such. But as the wire is lengthened by the tension, its temperature is increased. 2. If a heated wire, sustaining a weight, were inclosed in a tube of cold water, would the heat given off by the cooling wire elevate the temperature of the water to the same extent that it would if there were no weight attached? A. Yes; there would be no difference.

(6412) **L. R. C. asks: 1. Would it be** practical to run a dynamo with a water motor? The motor is 10 horse power, with an unlimited supply of water at 102 pounds pressure per square inch. A. Yes. 2. If practical, how many 16 candle power lamps could be used, also what size dynamo should be used? A. About 80 with an 80 light dynamo. 3. If power is not steady enough, could a storage battery be used to make the current steady? A. Yes; but it is preferable to use the power directly.

(6413) **F. P. C. writes: Is differential** or integral calculus used in the work of electrical engineering? If so, to what extent, i. e., in the calculations necessary in above mentioned profession? A. Very little, except in deducing laws and working formulas. For original work the calculus is most useful.

(6414) **M. S. P. writes: Is asbestos** paper a good material to use between the plates of a storage battery? If not, what can be used? A. It is better to omit all such material if possible. The trouble with asbestos will be its going to pieces in the solution.

(6415) **E. W. A. asks how to make an** inexpensive paste that will do to stick a paper label on tin. I have tried several different kinds of paste and glue, but after becoming dry the label peels off every time. A. 1. 4 parts shellac, 2 parts borax; water, 80 parts; boil until the shellac is dissolved. 2. Add 4 ounces dammar varnish to 1 pound of tragacanth mucilage. 3. Balsam of fir, 1 part; turpentine, 3 parts; use only for varnished labels. 4. Butter of antimony is good to prepare the tin for the label. 5. Venice turpentine added to good starch paste makes an excellent mounting medium.

(6416) **M. C. C. says: Will you kindly** inform me through your columns if there is anything to put on windows to keep them from frosting, and what its composition is? A. A thin coat of pure glycerine applied to both sides of the glass will prevent any moisture forming thereon, and will stay until it collects so much dust that it cannot be seen through. Surveyors can use it to advantage on their instruments in foggy weather. In fact, it can be used anywhere to prevent moisture from forming on anything, and locomotive engineers will find it particularly useful in preventing the accumulation of steam as well as frost on their windows during the cold weather.

(6417) **E A. G. writes: Please give rule** for figuring the power derived from balance wheels. A. There is no power derived or generated by the motion of balance wheels. They only transmit power that is imparted to them when augmenting their motion. Their usual office is to equalize speed by their momentum, through which they transfer the force received at the maximum to the minimum sections of the crank revolution. When a balance wheel is running free, it gives out power while in motion. Its weight in pounds multiplied by its rim velocity in feet per minute is its momentum in foot pounds, and this product divided by 33,000 is its horse power for any moment.

(6418) **W. H. Van A. writes: 1. Does it** ever snow when the thermometer is at zero or below? A. There is no place on our earth where it is too cold to snow. Blizzard snow storms have been experienced by the winter sojourners within the Arctic circle. 2. Is it ever too cold for snow—if so, why? A. As a general rule, the snows during very cold weather are light, for the reason that the quantity of watery vapor that the atmosphere can hold at low temperature is very small in proportion to the volume just above the freezing point, which accounts for our heaviest falls of snow occurring when the thermometer is between 20° and 30° Fahr. 3. Some persons entertain the idea that it is sometimes too cold to snow. Is that not a popular delusion? If not, please explain why it snows in climates where it is intensely cold? A. The popular saying that it is too cold to snow is only comparative, and not strictly true for any zone, and may be derived from the comparative dryness of very cold air. The atmosphere when saturated, and ready for snow fall, contains but one-half as much water at zero as it does under like conditions at 20°, and but one-third as much as at 32°, and this is about the average volume of snow storms at these temperatures, although special conditions sometimes produce extreme snow falls.

(6419) **G. T. asks: 1. One part of diastase** can convert 2,000 parts of starch into dextrine and then into grape sugar, at a temperature of 150° Fah. How much longer would it take if the temperature were 100° Fah.? A. It will not operate at a low temperature. 2. Has diastase any converting power over cellulose or gum of a starchy nature? A. Not over cellulose. 3. Does atmospheric oxygen take an active part in the conversion? A. It takes no part. 4. Does diastase convert starch into sugar by abstracting the element of water? A. No; by fixation of water. 5. How is cellulose converted into glucose? A. By treating it with perfectly cold oil of vitriol, and after standing rubbing it up with water, and boiling the mixture thus diluted for three or four hours with replacement of the water. 6. Where can diastase (commercial) be procured? A. Address Queen & Co., Philadelphia, Pa.

(6420) **G. A. writes: 1. How many** gravity cells 6×8 will it take to maintain a chloride accumulator, giving a current of 6 volts, 250 ampere hours, used from two to four hours per week, running ¼ horse power motor? A. 32 cells—eight in series, four in parallel. 2. How long (about) will it take to charge said accumulator for same amount of work, with a dynamo having a current of 25 volts and about 8 amperes? A. Five hours. 3. What power (about) will I get out of a 500 pound weight hung in a chain on a sprocket about 10 inches diameter, geared from 1 to 1,000, having 3 gears, 1 to 10 each, the small gear being brass, with an escapement as governor? A. The arrangement will involve a very large loss by friction, and as you do not give the rate of descent of the weight, the query cannot be answered.

(6421) **L. W. C. asks how to figure the** lines of force in a magnet, that is, how many ampere turns should I wind a magnet in order to get 10,000 lines to the square centimeter. A. For magnetic circuit calculations, see Sloane's "Arithmetic of Electricity," $1 by mail. The rules are not accurate except for full iron or steel circuits, owing to leakage of lines of force.

(6422) **C. B. V. asks: 1. What size and** how many turns and layers of wire to use in the primary of an induction coil where the secondary is 60,000 turns of No. 30, wound in 68 layers? A. Use 4 or 5 layers No. 20 wire. 2. Would double cotton-covered wire do in the secondary? A. Yes. 3. Can you tell me where I can get information about induction coils and experiments with them? A. See our SUPPLEMENT, Nos. 160, 166. 4. About what length of spark would this coil give with 8 cells of Bunsen battery? A. One-eighth to one-quarter of an inch.

(6423) **A. L. C. asks: 1. Is it considered** safe to have the disks of a dynamo armature in electrical connection with the shaft? A. Yes. 2. Is the black oxide of iron on the disks sufficient to insulate them from one another? A. Hardly; it is better to use thin paper. 3. Can you give me some practical rule by which I can determine, approximately, the number of ampere turns necessary to produce a certain intensity of magnetic force per square inch of area. A. See Sloane's "Arithmetic of Electricity," or Thompson's works on the electro-magnet. The rules are not accurate, owing to magnetic leakage.

(6424) **T. H. M. asks what size wire to** use in the circuit of the sixty light dynamo described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 865, the circuit to be about two miles long. A. For full current use No. 7 wire; as branches are taken off, proportion the size to the amperage.

(6425) **W. B. P. asks: How many and** what size cells of Edison-Lalande type will run the motor described in SUPPLEMENT, No. 641? A. Ten cells type W.

(6426) **E. A. T. asks: 1. Will a simple** atomizing burner be suitable for a small forge? A. Yes, if properly constructed. 2. How many volts and amperes are necessary to run motor described in SUPPLEMENT, No. 767, ten inch fan? A. Twelve volts, two amperes. 3. Is the motor efficient? A. Its efficiency is not very high. 4. What is the average expense per hour to operate with plunge battery? A. This has not been determined. 5. In calculating the capacity of storage batteries, do you consider both sides of the plate (positive)? No; allow 5 to 6 amperes per square foot of immersed positive plate. 6. Are sal ammoniac batteries with carbon negative equal to the Leclanche with carbon and manganese? A. They have had extensive use, but the Leclanche is probably preferable. 7. Do dry batteries generally have more or less internal resistance than liquid batteries? A. More resistance than chromic acid batteries.

(6427) **G. J. W. writes: How can I** fix the skins of some small animals so they may be used for furs? A. Skins, to Preserve (as a Mole Skin).—Supposing the skins are dry, they should be softened throughout by soaking in pure water; soft water is best, but any ordinarily pure water may be used, and care must be taken that the skins are thus soaked only a sufficient time to soften them. Then clean off any bits of flesh that may remain on the flesh side, rinse all well, shake off the loose water, and gently stretch out and tack on a board, flesh side up. Then sprinkle with a mixture of powdered alum and salt, about two-thirds alum and one-third salt, enough to just cover every part. As the skin dries, it takes up the mixture, but if any be left on the surface the second day, sprinkle on a little more water, otherwise put on more alum and salt, and sprinkle. Two to three days should be sufficient for such small skins, the idea being to give the skin all of the alum and salt it will take up while in a moist condition. This tawing process makes the hair firm, a gentle rubbing and beating softens the flesh side, and it is preserved from decay, although tawed skins are never calculated to stand much wetting. This process is well adapted for all small skins, although those which are heavier require more time, and the flesh sides are sometimes folded together, and the skins rolled up. When the skins are freshly taken off, no soaking is needed, but more care is then called for in thoroughly washing off and cleaning them, and the first application of salt and alum should be in proportions of one-half each. It requires the judgment of a tanner to deal with skins in a dry state which may have become partly damaged before drying, and it requires special knowledge also to tell whether a dry skin is so damaged.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

February 12, 1895,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Adding and daily receipts registering mechanism, cash, J. H. Voss .... [illegible]
Aerating beer or ale, device for, M. H. Hart .... [illegible]
Air compressor, J. F. Blake .... [illegible]
Air purifying device, C. Peters .... [illegible]

Alarm. See Fire alarm. Time alarm.
Alloy, quaternary, De Susini & Langlois ... 533,930
Altitudes at sea, instrument for obtaining, R. T. Morehouse ... 534,225
Amalgamator, gold, A. & J. W. Carlson ... 534,196
Animal trap, J. Sherrett ... 534,014
Ankle support, A. Sessler ... 534,179
Aquarium, L. Hohe ... 534,052
Armature coils, apparatus for winding, H. Geisenhoner ... 533,965
Armature for dynamo electric machines, H. F. Parshall ... 534,079
Armature winding, D. P. Thomson ... 533,880
Armor plates, manufacturing, Sobinitz & Ehrenberger ... 534,178
Auger bit, A. L. Adams ... 533,855
Autotype, A. M. Boon ... 534,175
Baling press, H. Deitz ... 534,205
Ball apparatus for practicing golf, etc., captive, R. G. Graham ... 534,041
Battery. See Electric battery. Galvanic battery.
Bearing, ball, W. Meeker ... 534,047
Bed and table, combined folding, H. Hasselpen ... 534,095
Bell striker, automatic, E. Rogers ... 534,010
Belt suspender, Freeman & Marble ... 533,962
Bending machine, roller, C. P. Higgins ... 533,940
Bicycle, H. D. Moise ... 533,912
Bicycle saddle, L. L. Richmond ... 533,921
Binder, temporary, R. H. Vernon ... 534,030
Bit. See Auger bit.
Blind slat rod, W. H. McFarland ... 534,076
Block signal system, electric automatic, J. B. Stewart ... 533,926
Blower, steam jet, W. Storm ... 534,087
Boiler. See Steam boiler.
Boiler furnace, steam, J. Smithley ... 534,086
Boiler furnace, steam, T. York ... 534,026
Bolting apparatus, C. F. Hardy ... 534,045
Bootjack, C. Ferguson ... 534,035
Bottle cap, W. H. Northall ... 534,001
Bottle stopper, G. F. Atwood ... 534,188
Bottle stopper, G. T. Chamberlin ... 534,031
Bottle stopper, B. Ramsey ... 534,174
Box. See Match box. Packing box. Strong box.
Box making machine, A. Carey ... 534,136
Brake. See Car brake.
Bridge, G. M. Clymer ... 533,932
Brush, J. A. Sampsell ... 534,011
Brushing machine, E. Waters ... 534,128
Bulletin board, M. Petry ... 533,915
Bumper, W. S. Hill ... 533,934
Burial casket, J. P. Hill ... 534,046
Burial casket lining, Louden & Stremmel ... 534,165
Burial vault, C. W. Spencer ... 534,232
Burner. See Oil burner. Straw burner. Vapor burner.
Button attaching machine, W. E. Elliott ... 533,874
Cabinet, work, M. S. Mason ... 534,118
Cake machine, H. Huey ... 534,106
Calipers, micrometer, O. J. Ebert ... 533,872
Camera. See Magazine camera.
Candle holder, crimper, and cutter, combined, A. J. Carter ... 534,137
Cane, etc., apparatus for expressing sap or juice from, D. Drummond ... 533,871
Car brake, railway, S. P. Mitchell et al ... 534,224
Car brake, safety, J. M. Smith ... 534,245
Car coupling, P. Brown ... 533,985
Car coupling, C. L. Buswell ... 534,084
Car coupling, J. Gilliland ... 534,217
Car coupling, S. B. Moss ... 534,168
Car draught rigging, railway, T. B. Kirby ... 534,221
Car fender, A. Piepho ... 533,916
Car fender, C. W. Stringham ... 533,939
Car fender, street, Lundberg & Mattice ... 534,114
Car life-saving guard, Mauro & Renna ... 533,961
Car motors or other electrical apparatus, regulating device for, H. F. Parshall ... 534,078
Car safety attachment, street, A. E. Hughes ... 534,218
Car wheel chill, W. Fawcett ... 534,215
Cars, means for mounting dynamos on railway, W. Biddle ... 534,092
Carbon, arc lamp, E. Thomson ... 533,882
Carbon filaments, manufacture of, T. A. Edison ... 534,207
Cardboard grooving machine, L. Nicolai ... 534,030
Cards, drawer or box for holding, index, H. J. Hall ... 533,998
Carrousel, M. T. Weston ... 534,237
Cash register, E. E. Heller ... 533,892
Chain, drive, T. B. Jeffery ... 533,957
Chair, J. D. Howe ... 534,189
Chair base and spring support, J. Harrington ... 534,055
Check hook, W. Maloney ... 533,907
Check rower and drill corn planter, combined, E. E. Hayes ... 533,902
Chimney cap, W. Mackert ... 533,995
Chocolate dipping or coating machine, W. Walter ... 533,974
Churn, J. B. Beam ... 534,132
Cisterns, means for cleaning, D. J. Daly ... 534,203
Clamp. See Dado clamp. Rail clamp. Screw clamp.
Clapboard gauge and marker, W. S. McCrea ... 533,914
Clasp. See Garment clasp. Garment supporter clasp. Stocking supporting clasp.
Clasp, G. L. Smith ... 534,181
Clock synchronizer, H. S. Prentiss ... 533,919
Closet range, washout, Clifford & Gavin ... 534,082
Clothes drier, H. W. Libbey ... 533,993
Coal drill, O. P. Swanson ... 534,236
Coat, J. H. De Bruyn ... 534,204
Combination lock, I. Summer ... 534,098
Compass, beam, Heinkel & Weber ... 534,152
Compasses, self feeding operated recording instrument for, C. L. Jaeger ... 533,902
Compound engine, A. Von Borries ... 534,156
Controller, series parallel, E. D. Priest ... 533,920
Conveyers, compensating gearing for, J. M. Dodge ... 534,098
Cop, multiwound, S. W. Wardwell, Jr ... 533,934
Cotton chopper, N. H. Newton ... 534,231
Cotton gin, roller, J. E. Coleman, Jr ... 534,123
Cotton gin, saw, J. W. Cooper ... 534,140
Coupling. See Car coupling. Thill coupling.
Cover for milk or other cans, A. Ernst ... 533,876
Cover, frying pan, D. Cleary ... 534,138
Crank arm, Brachhausen & Wolff ... 534,135
Crimping machine, W. Todd ... 534,022
Crusher. See Ore crusher.
Cultivation apparatus, steam, R. H. Fowler et al ... 534,216
Cultivator, R. A. Boudreaux ... 534,134
Cultivator, J. H. Knapp ... 534,222
Cultivator, corn, S. S. Gerrish ... 534,039
Cultivator head, adjustable, J. N. Clouse ... 534,159
Cultivators, slide for tongueless, J. D. Monaghan ... 533,902
Current motor, alternating, H. Hasler ... 534,151
Cut-off mechanism for stand pipes, R. McGowen ... 534,171
Cycles, racing index for home trainer, A. L. Knighton ... 534,223
Cyclometer, J. E. Bean ... 534,133
Dado clamp, J. T. Frazer ... 533,881
Detacher, H. W. Leavitt ... 534,120
Display card and holder, W. F. Jones ... 534,157
Door fastener, J. A. Hickok ... 534,153
Dredging apparatus, J. Gwynne ... 534,149
Drier. See Clothes drier.
Drier for brewers' grains, etc., P. B. Taylor ... 533,929
Drill. See Coal drill.
Drilling machine, Smart & Martin ... 534,180
Drying cylinder, rotary, J. Mandot ... 533,980
Dust collecting device, O. S. Moffet ... 534,120
Dust collector, J. H. Holland ... 534,008
Electric battery, J. M. Wells ... 533,936
Electric conductor tip, A. Metzger ... 533,910
Electric controller, G. F. Card ... 534,090
Electric machine, alternating current dynamo, A. Ekstrom ... 533,873
Electric machine, dynamo, R. Fuller ... 534,038
Electric machine, dynamo, E. Thomson ... 533,931
Electrical exchange system, Hey & Parsons ... 533,893
Elevating and conveying mechanism, J. M. Dodge ... 534,097
Elevator cup attachment, W. H. Emerson ... 533,875
Embroidering machine, hand, F. Ohl ... 534,077
Enameling metal, J. Cochran ... 533,945
Engine. See Compound engine. Gas engine.
Engine roll, Jordan, E. W. Barton ... 533,857
Excavator, A. Barhite ... 534,241
Eyeglasses or spectacles, attachment for, H. Franc, Jr ... 533,987
Feedwater regulator, C. A. & H. F. Straub ... 534,125
Fence machine, wire and picket, D. A. Green ... 533,887
Fence, panel, G. B. Bruce ... 533,943
Fence post, S. Leffler ... 533,929
Fence post, G. W. Lenty ... 533,988
Fence post, W. Van Wert ... 534,089
Fence stay, wire, E. E. Myers ... 534,169
Fence stay, wire, J. W. Snedeker ... 534,017
Fence, wire, Stowell & Terry ... 534,234
Fiber disintegrating machine, J. M. Holmes ... 533,954
Fifth wheel, H. C. Swan ... 534,126
File, bill, A. H. Swank ... 533,972
Filter, L. B. Holt ... 534,087
Filter, J. C. Wands ... 534,056
Fire alarm apparatus, S. W. Ludlow (r) ... 11,471
Firearm, recoil operated, A. Mieg ... 533,911
Fire extinguisher, hand, S. M. Stevens ... 534,182
Fireproof floor structure, T. Bailey ... 534,189
Fire through buildings, means for preventing spreading of, J. D. Baker ... 533,856
Flask. See Toilet flask.
Flushing tank, T. C. Beaumont ... 533,962
Foot gear pattern, adjustable, A. Ehrenreich ... 534,210
Fumigator, M. Y. Warren ... 534,091
Furnace. See Boiler furnace. Roasting furnace.
Furnaces, cement ring for hot air, E. C. Fox ... 534,145
Furniture, convertible, S. S. Smith ... 533,925
Fuse, S. Jackson, Jr ... 534,107
Fuse block and socket, F. W. Mount ... 533,913
Gauge. See Clapboard gauge. Pressure gauge.
Galvanic battery, W. P. Freeman ... 534,036
Game apparatus, E. Preston ... 534,080
Garbage, etc., extractor and evaporator for, F. G. Wiselogel ... 533,940
Garbage, process of and apparatus for treating, E. Holthaus ... 533,898
Garbage, treating, E. Holthaus ... 533,896
Garbage treating apparatus, E. Holthaus ... 533,897
Garment clasp, C. F. Roper ... 534,051
Garment stretching apparatus, R. C. & G. A. Rutherford ... 534,058
Garment supporter clasp, F. D. Harding ... 534,044
Gas engine, J. W. Lambert ... 534,163
Gas engine, Rider & Vivian ... 533,922
Gas generator, J. H. Miller, Jr ... 534,070
Gate, Wuttenberg & Hawkins ... 534,129
Gate operating mechanism, W. Wise ... 534,186
Generator. See Gas generator.
Grinding machine, W. E. Cook ... 534,200
Grinding wheel, J. H. King ... 533,984
Gun, magazine, G. F. Fogerty ... 533,949
Guns, safety breech lock for, L. V. Benet ... 533,930
Guns, safety lock for machine, L. V. Benet ... 533,859
Hammer, drop, F. A. Pratt ... 534,008
Handle, I. Pierce ... 534,108
Hanger. See Hat and coat hanger. Shaft hanger.
Harrow disk sharpener, Stiles & Chrestenson ... 533,927
Hat and coat hanger, G. Anderson ... 534,059
Hat block, J. Marshall ... 533,906
Hay frame brake, P. W. Pursley ... 534,081
Heat regulating apparatus, automatic, W. Waters ... 533,975
Heddle making machine, J. Benaxet ... 533,856
Heel edge burnishing and finishing machine, boot, C. H. Southall ... 533,969
Hook. See Check hook.
Induction converter, T. A. Edison ... 534,208
Inhaler, F. Forne ... 533,880
Injector, R. G. Brooke ... 534,194
Inkstand cover, Phillips & Palmer, Jr ... 534,227
Insect exterminator, Twyman & Thomas ... 534,127
Insect exterminator, H. Wagner ... 533,933
Jack. See Bootjack.
Jacket and waist, combined, M. Loewenthal ... 533,904
Joints, machine for grinding ball and socket, F. Brandes ... 533,863
Journal bearing, roller, B. Beaupre ... 533,983
Ladder and portable platform, scaling, W. H. McKiever ... 533,908
Lamp, J. Funck ... 534,100
Lamp, Argand, T. Hipwell ... 534,103
Lamp, electric arc, T. Spencer ... 534,086
Lamp filament, incandescent, T. A. Edison ... 534,206
Lamp, incandescent electric, T. A. Edison ... 534,209
Latch and lock, combined, E. N. Beebout ... 534,242
Lathe, E. J. McClellan ... 533,997
Lathe, wood turning, Matthew & Collier ... 534,119
Lead trap and making same, J. F. Wolff ... 534,087
Leather, manufacturing articles of sole, M. Frank ... 534,146
Leg, artificial, E. Chapman ... 534,199
Letter boxes, construction of, F. Conrad ... 534,141
Loader, coke or coal, W. Wright et al ... 534,086
Lock. See Combination lock.
Locomotive, electric, E. M. Boynton ... 533,861
Locomotive or other water tube boiler, G. J. Perkins ... 534,002
Loom reed, A. Weithaase ... 533,935
Lubricator, J. Powell ... 534,006
Magazine camera, A. Lundelius ... 534,115
Magnesia, making light carbonate of, H. Endemann ... 534,213
Magnesium carbonate, making light, H. Endemann ... 534,212
Magnesium carbonate, making light basic, E. Rueff ... 534,177
Match box, self-lighting, A. Rothschild ... 534,176
Mathematical and drawing instrument, A. M. English ... 534,040
Measuring apparatus, A. Y. Reeder ... 534,082
Measuring vessel, J. A. Hooper ... 534,154
Metal drilling tool, F. A. Pratt ... 534,009
Mill alarm device, C. L. Judge ... 534,158
Milling machine, Whitney & Johnston ... 533,978
Milling tool, A. H. Kent ... 534,230
Moistener and sealer, envelope, J. M. Dempsey ... 533,948
Moulding and making same, ornamental, W. M. Terriberry ... 534,065
Motor. See Current motor.
Mower, lawn, F. H. Zohe ... 534,187
Musical instrument, R. Essig ... 534,144
Musical instrument, H. E. Geisendorff ... 533,984
Musical instrument string clamp, Hafer & Love ... 534,053
Nail set, combination, J. Dowling ... 534,143
Nut lock, J. W. B. Cook ... 534,201
Nut lock, W. A. Matter ... 533,909
Nut-lock washer, F. P. Hinds ... 533,895
Nut tapping machine, W. J. Sieffel ... 534,015
Oil burner, H. C. Hornish ... 533,989
Optometer, H. A. Huntington ... 534,156
Ordnance, construction and operation of, J. Faust ... 534,214
Ore crusher and amalgamator, J. Sutherland ... 533,971
Organs, cell and valve for reed, A. N. Ostlind ... 533,964
Packing box, D. S. Wing ... 533,939
Packing, piston rod, T. H. Holmes ... 534,104
Pamphlet covering machine, G. W. & H. C. Hull ... 534,219
Paper feeding machine, T. C. Dexter ... 534,095
Paper weight and clip, W. G. Adams ... 533,980
Pen, fountain, F. C. Brown ... 533,942
Pencil or pen holder for slates or drawing boards, P. S. Hannum ... 534,150
Picture mats with circular openings or holes, apparatus for cutting, M. E. Childs ... 534,061
Pigments, apparatus for manufacture of metallic, A. C. J. Charlier ... 534,197
Pin. See Safety pin.
Pipe. See Pump suction pipe.
Pipe fastener, H. N. Davies ... 533,870
Pipe section, angular, F. A. Swan ... 534,021
Plant support, adjustable, J. E. Hutchison ... 533,901
Planter and fertilizer distributing attachment for plows, seed, A. D. Simpson ... 533,924
Plating for vessels, etc., W. Stewart ... 534,185
Plow, chopper, and planter, combined, N. H. Newton ... 534,122
Post. See Fence post.
Press. See Baling press.
Pressure gauge, steam, N. W. Pratt ... 534,007
Pressure regulator, J. D. Brassington ... 533,864
Pump, R. H. Horton ... 533,955
Pump, centrifugal, S. Hughes ... 533,956
Pump cut-off mechanism for stand pipes, R. McGowen ... 534,170
Pump, force, G. W. Aldrich ... 534,240
Pump plunger attachment, Burke & McKune ... 534,195
Pump section pipe, F. Betts ... 534,191
Punch and register, ticket, W. T. Jenkins ... 533,903
Radiator, C. A. Ball ... 534,029
Rail bending tool, J. R. James ... 534,108
Rail clamp, G. W. Parsons ... 534,172
Railway conduit system, electric, F. S. Davenport ... 533,869
Railway crossing, R. Fuller ... 534,037
Railway distribution system, electric, W. H. Knight ... 533,905
Railway signal semaphore, D. H. Wilson ... 533,938
Railway signal, track operated, G. M. Chace ... 533,865
Railway signaling apparatus, C. L. Fielder ... 533,877
Railway spike, G. G. Rhoderick ... 534,230
Railway supply system, electric, M. Wheless ... 534,238
Railway switch, electric, R. A. Baldwin ... 534,028
Railway tie and chair, combined, J. A. Yast ... 533,941
Railway track joint, W. M. Hervey ... 534,102
Railway tracks, device for placing torpedoes on rails of, Griffin & Seller ... 533,888
Railway trains, apparatus for controlling gas supply on, E. F. Howlden ... 534,155
Reaper reel rake, W. Butterfield ... 533,944
Reeds for weaving, etc., manufacturing, Reizach & Emmott ... 534,229
Reel, K. E. Daly ... 533,868
Register. See Cash register.
Regulator. See Feedwater regulator. Pressure regulator.
Rein protector, E. W. Craine ... 533,947
Ribbon holder, J. S. Lyons ... 534,116
Roasting furnace, H. A. Keller et al ... 534,160
Rolling mills, roll for chain or bar, O. Klatte ... 534,110
Rope or cable coupling, R. Lee ... 534,165
Safety pin, E. Lewis ... 533,992
Sash fastener, J. E. Hartmann ... 533,891
Sash fastener, E. S. Winchester ... 534,185
Sawmill, I. W. Hay ... 533,951
Scaffold fastener, A. Kuhn ... 534,111
Screw clamp, hand, M. F. Larsh ... 534,164
Seal, L. A. Foote ... 533,879
Seal, metallic, N. A. Vurgason ... 534,023
Sewing machine quilting attachment, J. M. Stukes ... 534,020
Sewing machines, channel guide for shoe, M. L. Keith ... 534,159
Shade holder, E. Blackman ... 533,984
Shaft hanger, counter, D. J. C. Arnold ... 534,131
Sharpening razors, etc., apparatus for, J. W. C. Kleeberg ... 533,901
Sheet metal flanging machine, W. Westlake ... 533,976
Sheet metal milling or corrugating machine, W. Westlake ... 533,977
Shooting roll, non-adhesive, J. H. Mitchell ... 534,071
Shingle planing machine, W. J. Pugh ... 534,173
Signal. See Block system signal. Railway signal.
Signal mechanism, S. H. Stupakoff ... 534,235
Skid, barrel, H. E. Williams ... 534,130
Snow melting composition, J. W. Hallman ... 533,950
Soap shaver, L. Maisacher ... 534,117
Soda, apparatus for manufacturing caustic, T. Craney ... 534,033
Solder machine, wire, F. W. Schultz ... 534,084
Spinning, apparatus for facilitating doffing bobbins in, P. Clough ... 534,139
Spool cabinet, E. H. Northcutt ... 533,968
Spring. See Vehicle spring.
Square, folding, A. G. McDonald ... 534,246
Stay, dress, H. D. Stone ... 534,233
Steam boiler, sectional, G. Fillion ... 533,878
Steam trap, A. F. Nagle ... 533,900
Steam trap, J. Poulson ... 533,918
Steamer, wheat, F. M. Caine ... 534,030
Stocking supporting clasp, C. F. Roper ... 534,050
Stone drag, A. W. Ballou ... 533,981
Stove lid, Dillenbeck & Clute ... 534,004
Stove, vapor or gas, H. H. Kelley ... 534,161
Straw burner, F. Girtanner ... 533,886
Strong box, S. L. Saunders ... 534,012
Sunshade, portable, Ackermann & Frohlich ... 534,058
Switch. See Railway switch.
Tank. See Flushing tank.
Telegraphing machine, automatic, C. E. Yetman ... 534,025
Telephone and telegraphic system, combined, C. A. Shea ... 534,084
Telephone metallic circuit, C. A. Shea ... 534,083, 534,085
Telephonic and telegraphic system, combined, C. A. Shea ... 533,967
Thill coupling, G. A. Fowler ... 533,986
Thill coupling, D. B. McCapes ... 534,121
Tickler, office, F. A. Herrick ... 534,101
Time alarm, electrical, W. Wilke ... 533,979
Tires, valve for pneumatic, G. H. Tansley ... 533,973
Tobacco casing and flavoring machine, J. H. Kester ... 534,162
Tobacco leaves, machine for treating, J. W. Fries ... 534,147, 534,148
Tobacco plants, treating, S. T. Cole et al ... 534,095
Toilet flask, W. A. Brabrook ... 533,862
Toy swing, C. H. Brooks ... 534,068
Transfer case and bill file, combined, T. F. McGarry ... 534,226
Trap. See Animal trap. Lead trap. Steam trap.
Truck, H. Lind ... 534,113
Trucks, antifriction device for car, M. G. Hubbard ... 533,900
Tube bending machine, J. E. Richard ... 533,965
Typewriter's finger protector, C. H. English ... 534,211
Typewriting machine, J. W. Morris ... 534,072, 534,073
Typewriting machine, J. W. Schuckers ... 534,012
Valve, Grubb & Binns ... 534,042, 534,043
Valve, J. H. Pierce ... 534,228
Valve for operating automatic brakes, Rowell & Ayer ... 534,244
Valve, pressure reducing, E. P. Holly ... 533,953
Valve, straightway, J. H. Layman ... 533,901
Valve, straightway, J. Powell ... 534,004, 534,005
Vapor burner, I. Culver ... 534,202
Vapor burner, H. S. Giles ... 534,040
Vehicle, S. Mills ... 534,048
Vehicle, C. H. Stratton ... 534,019
Vehicle spring, C. A. Behlen ... 534,190
Vehicle wheel, G. Laube ... 533,990
Velocipede treadle, A. B. Curtis ... 533,867
Vending machine, coin-controlled, C. A. Shattuck ... 533,966
Voting machine, A. O. Abbott ... 534,239
Wagon, H. Just ... 534,109
Wagon or vehicle, tower, J. B. McCardell et al ... 534,075
Washer. See Nut lock washer.
Washing machine, Anderson & Hammarstrom ... 534,027
Watch bow fastener, E. J. Swedlund ... 533,928
Watchmaker's tool, W. C. Seyfriedt ... 533,923
Water closet seat attachment, J. H. Stevens, Jr ... 534,018
Water column, J. N. Poage ... 533,917
Waterproofing and preserving brick walls, etc., composition for, R. D. Gates ... 533,883
Wheel. See Fifth wheel. Vehicle wheel.
Windmill, F. A. Mathews ... 534,167
Window, L. H. Mullikin ... 534,074
Window guard, M. D. Wiedinger ... 533,937
Wire stretcher and connector, E. M. Cosner ... 533,946
Wire stretcher and staple puller, C. T. Howard ... 534,105
Woodworking machines, chip breaker for, Marsh & Overhiser ... 533,906
Wrench, J. S. Copeland ... 534,142
Wrench, F. Hansen ... 534,064
Wrench, A. L. Rose ... 534,124
Yoke center, neck, N. F. Harris ... 533,890

DESIGNS.

Bowl, etc., H. Berry ... 24,036
Box, W. Q. Tolman ... 24,032
Box or casing for cigarette wrappers, J. Cahen ... 24,031
Box pattern, cigar, S. D. George ... 24,030
Box, wooden, F. J. Edgars ... 24,033, 24,034
Box, wooden, W. C. Estes ... 24,035
Carpet, C. F. Gedney ... 24,017
Carpet, A. L. Halliday ... 24,018, 24,019
Carpet, J. B. Neil ... 24,020 to 24,022
Carpet, A. M. Rose ... 24,023 to 24,028
Chair, surf, P. A. Kuhn ... 24,038
Counter, S. J. Sherer ... 24,039
Draughtsman's instrument, W. K. Palmer ... 24,042
Hame hook, N. S. Wilson ... 24,041
Tobacco pipe, W. Demuth ... 24,029
Umbrella holder, K. D. Verity ... 24,037
Velocipede brake shoe, G. F. Hall ... 24,040

TRADE MARKS.

Agricultural implements, Johnston Harvester Company ... 26,058
Beverages and flavoring extracts, carbonated, Victor Barothy Bottlers Supply Company ... 26,028
Bluing, liquid, A. S. Stewart ... 26,036
Canned meats, fish, vegetables, and fruits, R. C. Williams & Company ... 26,043
Cement for uniting and mending articles of all kinds, Kay Brothers ... 26,051
Cigars, Power Grocery Company ... 26,048
Coffee, Ohio Coffee and Spice Company ... 26,045
Flour, H. W. Potter ... 26,038
Flour, wheat, G. W. Copland ... 26,039
Flour, wheat, Northern Milling Company ... 26,041, 26,042
Flour, wheat, Saginaw Milling Company ... 26,040
Hose with a woven covering, J. B. Forsyth ... 26,018
Hose, woven, Boston Belting Company ... 26,017
Hosiery, gloves, Jersey goods, and similar knit fabrics, Gebruder Lohse ... 26,015
Medicated material, powdered or dissolved, for use on the human body, Medical Novelty Company ... 26,026
Medicine and drug in powder and tablet forms, H. C. Duering ... 26,021
Metal, antifriction, W. N. Rumely ... 26,057
Paints, Tarr & Wonson ... 26,049
Paints, oils, and varnishes, Central Paint, Oil and Varnish Company ... 26,050
Paper, envelopes, lists and forms, letter, American Listing Company ... 26,013
Perfumery, Oakley Soap and Perfumery Company ... 26,027
Remedy, catarrh, W. Driscoll ... 26,019
Remedy for fever and whooping cough, Farbwerke, vormals Meister, Lucius & Bruning ... 26,022
Remedy for throat and lung troubles, J. E. La Rocque ... 26,024
Remedy for wounds, Farbwerke, vormals Meister, Lucius & Bruning ... 26,020
Rubber goods, mechanical, Boston Belting Company ... 26,052, 26,053
Salves and ointments, Baenziger & Martin ... 26,025
Shirts, Miller, Hall & Hartwell ... 26,014
Sirup and molasses, F. C. Schulte ... 26,044
Soap, laundry, Benjamin Brooke & Company ... 26,033, 26,034
Soap, perfumery, powders, and similar preparations, toilet, V. Klotz ... 26,029 to 26,031
Soap, scouring, laundry, and toilet, Brooke Soap Manufacturing Company ... 26,032
Specific, croup, W. W. Lee ... 26,023
Steel plates of all sorts, Crawshay Brothers Cyfarthfa ... 26,056
Stoves, oil, C. S. Upton ... 26,054
Trunks and other traveling cases, G. A. Allan ... 26,055
Vermouth, S. Piana ... 26,046
Washing fluid, Waples & Healy ... 26,035
Wheat, prepared breakfast, H. W. Potter ... 26,037
Whisky, W. Greer & Company ... 26,047
Yarns, B. Ulmann & Company ... 26,016

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.